The Electrical Industry's Weekly Magazine October 27, 1958

Electrical World

Price 50 Cents A McGraw-Hill Publication

4 **Modernize SERVICE FUNCTIONS to meet future growth**
...page 65

As its part in a major editorial project sponsored by McGraw-Hill's 34 business publications, Electrical World presents a series of reports on "Modernizing Electric Power Systems"

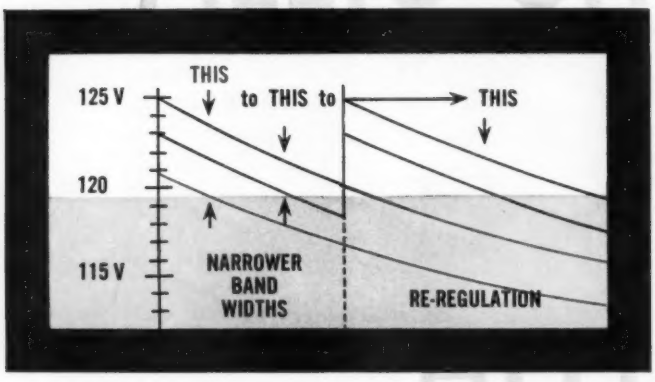
PLAN '59

Modernize now for growth and profits

A SPECIAL REPORT FROM McGRAW-HILL TO AMERICA'S BUSINESS EXECUTIVES

STEVENS RICE GS
UNIVERSITY MICROFILMS
313 N 1 ST
ANN ARBOR MICH

LOADS DOWN?



Use this simple way to increase revenue

Narrow band widths

Re-regulation

Lower cost regulators

It's elementary — yet the revenue-producing potentialities of engineered regulation are only beginning to be capitalized. A 1-volt increase on feeders means $1 per customer per year increased revenue. With cost of regulation reduced as much as 50%, immediate profits are possible.

Here's what can be done on many feeders:

1. **Use Narrow Band Widths** — Two volts or less. Adjust regulator settings to keep voltage at the maximum.
2. **Re-Regulate Voltage** out on a feeder to bring even larger returns and improved customer satisfaction.
3. **Use Lower Cost Regulators**—New three-phase distribution regulators provide 30% saving. Utilize *Vari-Amp* for additional savings. Proper use or elimination of transformer taps adds a 5% saving.

Talk it over with an Allis-Chalmers engineer. Contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Get new technical article on economics of regulator application

Originators of 5/8% Step Regulators

ALLIS-CHALMERS

A-5793

Electrical World

Vol. 150, No. 17 OCTOBER 27, 1958

Published 84 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue

CURRENT EVENTS

Campbell Clarifies His Stand on REA

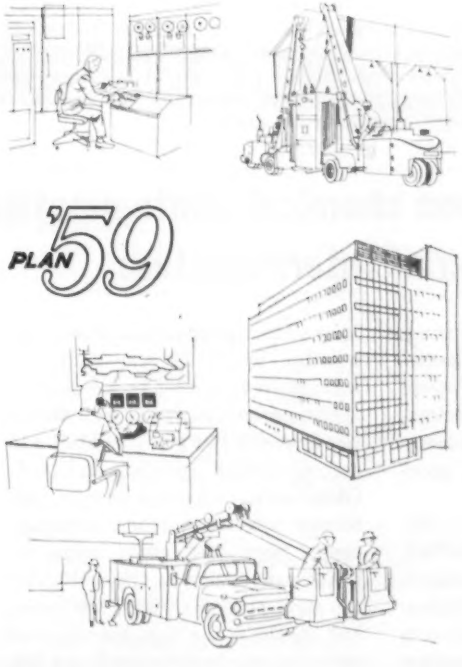
Comptroller General rules out REA loans along existing power lines, will report to Congress on violations.....p 59

MANAGEMENT NEWSLETTER

Business Outlook: '59 Shapes Up Strong

Signs point to a buoyant fourth quarter ushering in a strong new year for business. Here's a look ahead.....p 103

Special Report



Modernize Service Functions to Meet Growth

Utility service functions will expand to keep pace with system growth. Careful planning is required to take full advantage of opportunities for improving services and keeping costs in line. Our special report offers a variety of examples of modernization.....p 65

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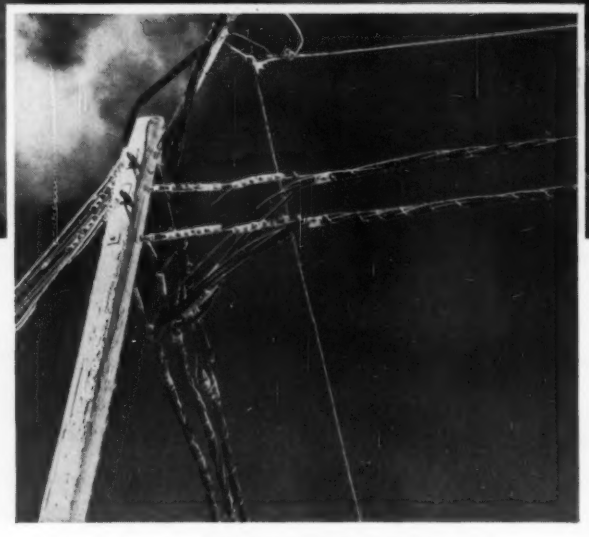

As the power goes . . . so go the operating costs at Intermountain Chemical Co.'s highly mechanized mining and refining operation. And every bit of this power—for digging, hoisting and processing of the ore—comes from Intermountain's power plant through 5kv non-shielded Okolite-Okoprene self-supporting aerial cables. They needed utmost dependability—and got it!

Heavy concentration of corrosive soda ash dust and severe environmental conditions have no effect at all on this aerial cable. Note the simple, low-cost support pole—no cross-arms needed—as well as the easy installation and splicing procedures used for this light weight, unshielded 5kv cable.

Okolite-Okoprene Aerial Cables withstand chemical contamination . . . assure continuous production at Intermountain

"These 5,000-volt aerial cables have withstood heavy concentrations of soda ash dust for eight years now," says Louis Ruffini, staff assistant to the maintenance superintendent for Intermountain Chemical Company of Wyoming. "They've proved to be invulnerable to temperatures as low as —40°F and as high as 120°. They've faced winds up to 70 mph, and they tested perfectly at 40,000 volts d-c. We expect them to be around a long time yet."

These facts are vital to Intermountain. The company depends almost completely on electrical power to mine trona ore and refine it into almost half a million tons of soda ash per year. That's why they stress the dependability of their Okolite-Okoprene, 3/c, self-supporting power cables with aluminum conductors, cables that distribute power to every sub-station in the mine and processing plant.

"Installation of the aerial cables was very simple," says Mr. Ruffini, "thanks to their flexibility, light weight, and self-supported Dualay construction . . . and due also to the unshielded 5,000-volt construction that permitted the simplest of splicing and terminating procedures."

For *your* power needs, this construction can offer installation and operating economies, combined with long-term dependability. Okolite insulation has a 30-year record of service, maintaining in severest installation conditions its high dielectric strength and great resistance to corona cutting, moisture and heat. Okoprene sheath offers unusual protection against weather, abrasion, ozone, heat, cold, many acids, alkalies and chemicals. Application by the strip process of both insulation and sheath is the final assurance of matchless performance and long life. For the Okolite-Okoprene self-supporting aerial cable that best suits your needs, see 56-page Bulletin EW-1074. It's free . . . just write The Okonite Company, Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

6216

Future of the Electric Car

On our news pages last week we carried another intriguing progress report on the electric automobile. We expect to see some of them on the road next year.

But the question that comes forth is: Will the electric-power car be a success? Everyone in the electric utility industry should certainly hope so. One can easily let his imagination run wild with the effect it would have on the load factor problem of the country. Just think of the off-peak charging.

But instead of dreaming about the pleasant future it is better to concentrate our efforts on making this future possible. To do this the industry should make a promotional pitch for the success of this means of transportation.

The means to do this are already available. Our story last week told of the production schedule and the marketing plans of the Stinson Tool and Engineering Co. One utility has already announced its intention to buy several of these cars. This certainly is an excellent way to promote a potentially great user of electricity.

Such an approach deserves the consideration of all utilities.

Fischer Black

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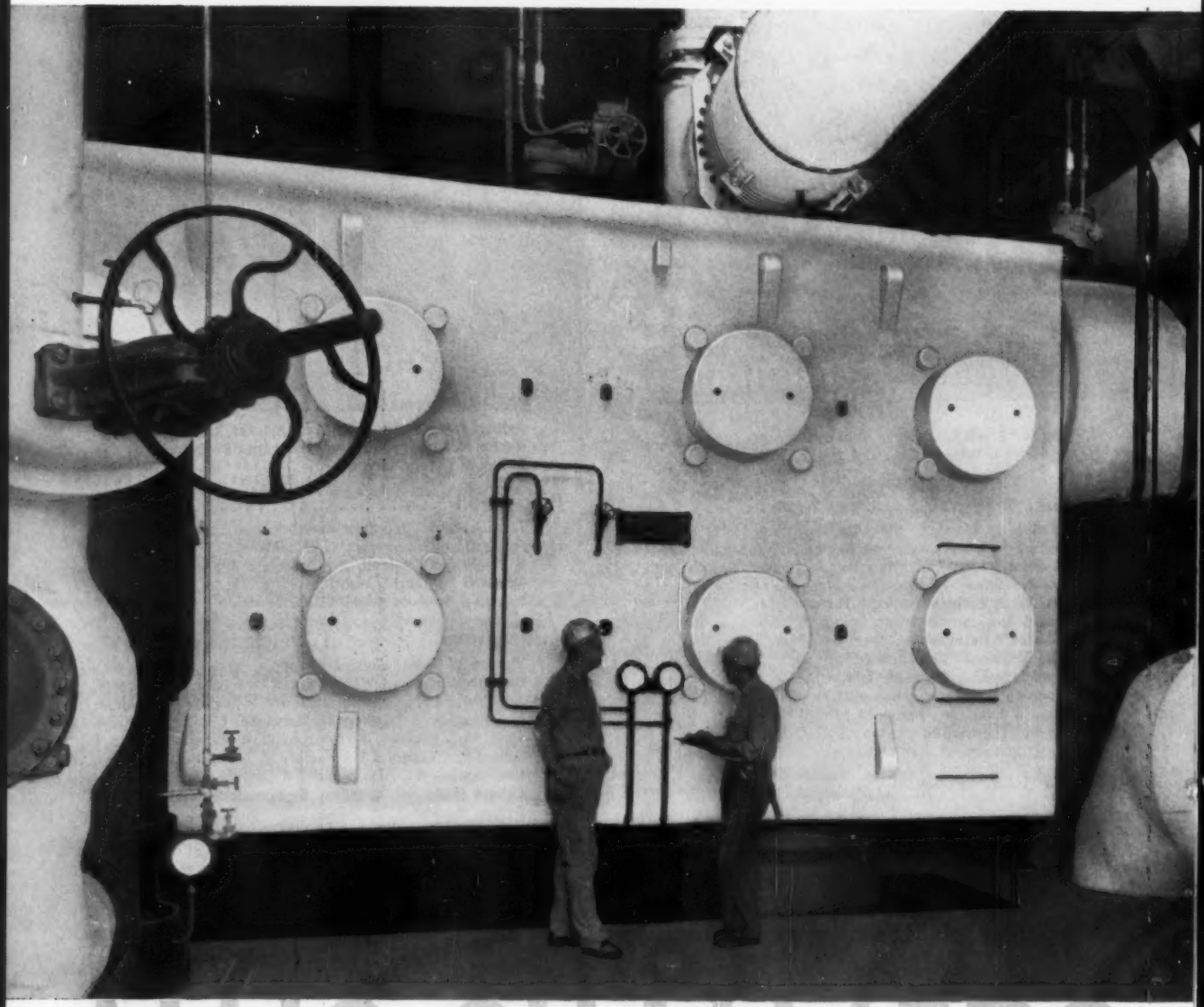
ALLIS-CHALMERS

Another Example of Allis-Chalmers

One-half of the twin condensing unit, together with 67,000-gpm circulating water pump, in service at Waukegan Station Unit No. 7 since June 11, 1958.



ALLIS-CHALMERS

Condenser Leadership

180,000 square foot condenser

. . . largest in operation

First 325-mw turbine in operation served by A-C condenser at Commonwealth Edison, Waukegan Station.

This single-pass, twin condensing unit, with its 180,000 square feet of surface, breaks a record for size originally established by Allis-Chalmers units built in 1927 (also for Commonwealth Edison at State Line Generating Station).

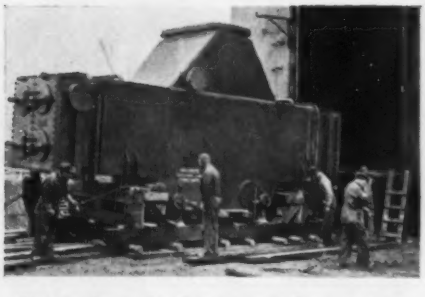
Of special interest to utility men is the use of aluminum tubes. Over 20,000 of these tubes went into this condenser.

Condenser shells are connected to maintain balanced conditions. In addition, the divided water boxes are connected so that any combination of one or more circulating pumps will operate the condensing plant.

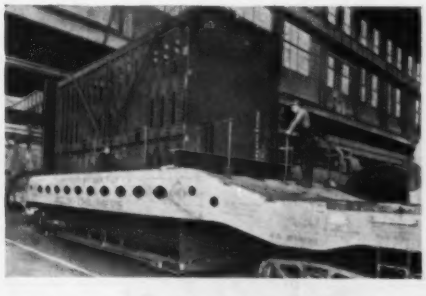
The four circulating pumps and three condensate pumps, as well as motors, were also built by Allis-Chalmers.

Allis-Chalmers has the experience, the facilities, and the backup of auxiliary equipment to meet your special problems.

Get information! Call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



First condenser for first commercial-type nuclear power plant in operation is Allis-Chalmers 5300-sq-ft unit with aluminum tubes, double tube sheets, special leak tightness.



First with specially built "well-center" freight cars to accommodate large condenser sections, thereby reducing shipping problems, cutting installation time and costs.

First welded tube condenser prevents condensate contamination, meets problems of supercritical pressure.

ALLIS-CHALMERS

A-5843

the price is RIGHT!

TYPE M STRAND

If someone asked you the price of Copperweld Strand, the chances are that you'd err on the high side. Why?

Simply because this permanently non-rusting guy and messenger strand has for more than 40 years been rated absolute tops in its field. Judged by the admittedly longer service and maintenance-free life its use assures, you'd naturally expect it to cost more—much more. But that's no longer true.

Now, with the new Type M Strand, you can obtain all the money-saving and performance advantages of Copperweld construction at a price comparable to that of ordinary strand. This was made possible by developing new higher strengths especially suited for guy and messenger use, and introducing new cost-cutting production techniques.

Pliable and easy to handle, this superior strand is available in a complete range of breaking strengths. Ask us to quote on your guy and messenger requirements. You'll find the price is right.

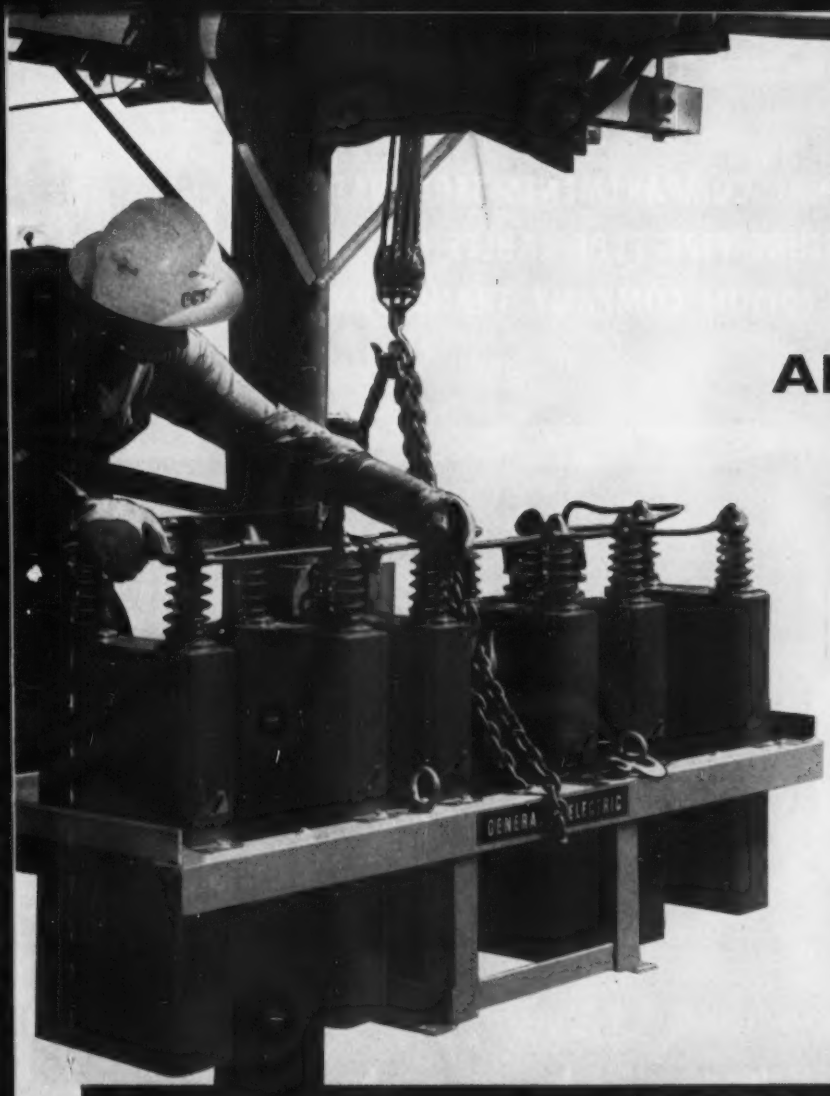
COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

Furnished in coils of 250, 500 and 1,000 feet depending on the size. Reels of 2,500, 5,000 and 10,000 feet are also available.

Copperweld®

TYPE M™

GUY and MESSENGER STRAND



ANOTHER GENERAL ELECTRIC

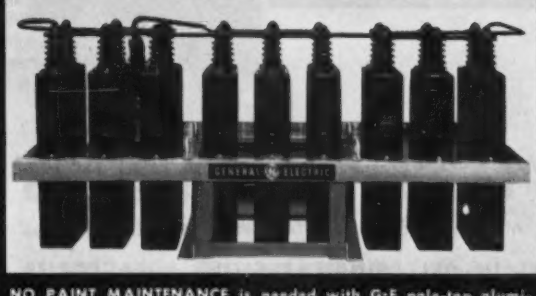
KILOVAR PLUS

TO HELP YOU CUT INSTALLATION AND MAINTENANCE COSTS . . .

New Aluminum-rack Pole-top Capacitors

- **Lightweight and factory-assembled for easy installation, less strain on pole**
- **Corrosion-resistant to require less maintenance**
- **Braced to front-of-pole for maximum free climbing space**

INSTALLATION IS EASY with lightweight, structural aluminum racks and front-of-pole brackets and mounting arrangement.



NO PAINT MAINTENANCE is needed with G-E pole-top aluminum racks and stainless steel capacitor cases, helping to cut costs.

15–20% less weight of G-E factory-assembled pole-top capacitor equipments in aluminum racks makes installation fast, easy and inexpensive, and reduces bending moment on the pole.

Maintenance costs are low, too. Rugged, jig-welded aluminum structure will not require protective painting, even if drilled in the field. And, G.E.'s stainless steel capacitor case requires no protective paint maintenance.

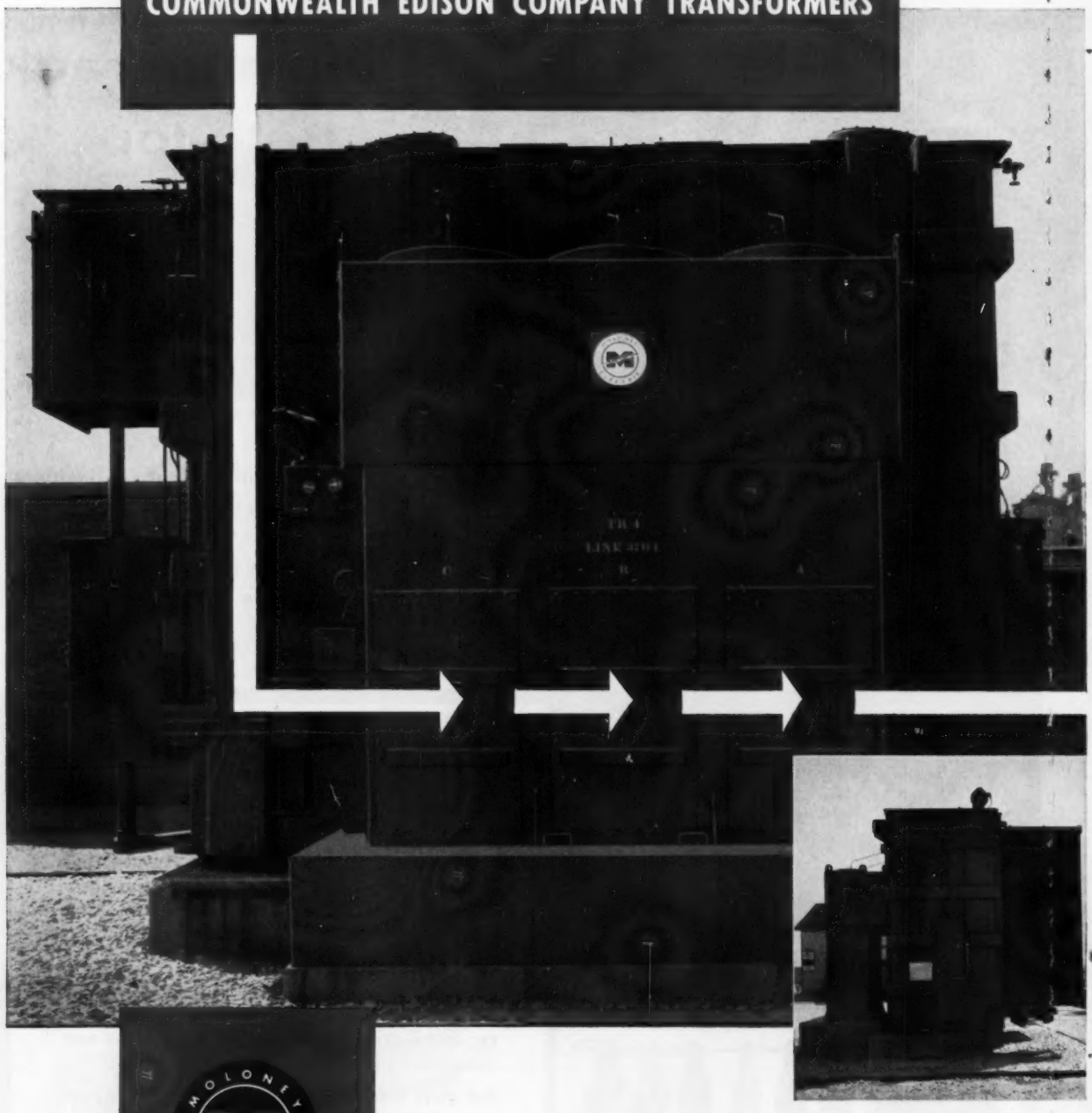
Front-of-pole mounting and bracing affords ample free climbing space, provides greater safety, and contributes to ease of installation and connection to system.

For more information contact your G-E Apparatus Sales Office, or write to Section 445-21, General Electric Company, Schenectady, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

138 KV TERMINAL COMPARTMENTS TERMINATE HIGH PRESSURE PIPE TYPE CABLES ON COMMONWEALTH EDISON COMPANY TRANSFORMERS



MOLONEY ELECTRIC

Manufacturers of Transformers for Utilities, Industry,

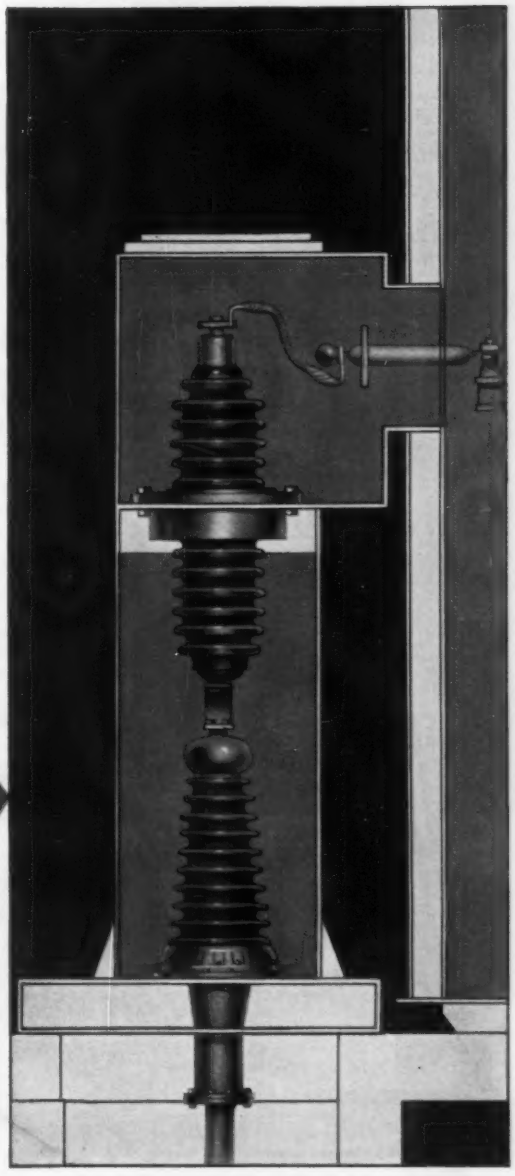
SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES

Provide Positive Isolation Of Cable Oil From Transformer In Event Of Cable Termination Leaks

To provide service in some areas of Chicago, Commonwealth Edison Company uses 138 KV lines, located underground, and therefore, 138 KV 200 PSI high-pressure, oil-filled cables are used.

Termination of a 138 KV line at a transformer presents the problem of preventing the cable oil from becoming mixed with the transformer oil in the event of a failure or a leak at the high voltage pothead termination. An effective solution to this problem is the two-compartment terminal chamber developed by Moloney in cooperation with Commonwealth Edison Company.

The upper compartment of the terminal chamber is attached to the transformer tank wall. Electrical connections from the transformer coils to barrier bushings installed in a partition between the upper and lower compartments of this terminal chamber are made through openings in the tank wall with transformer oil common to both the transformer tank and this upper terminal compartment. The lower compartment houses the high voltage potheads which are electrically connected to the lower terminals of the barrier bushings. This lower compartment is also filled with transformer oil and is equipped with a pressure relief vent, as well as a pressure-vacuum gauge and an oil level gauge having alarm contacts. Phase barriers are placed between the potheads.



In the case of even a slight leak of cable oil into the lower compartment, the pressure-vacuum gauge or the oil gauge will give indication of this condition and when the pressure or oil level reaches a predetermined point an alarm will be actuated. In event of an extremely bad leak the pressure relief vent will discharge excess oil.

Once again, Moloney, in cooperation with a customer, has developed a satisfactory answer to one of the day-to-day problems confronting the utilities.

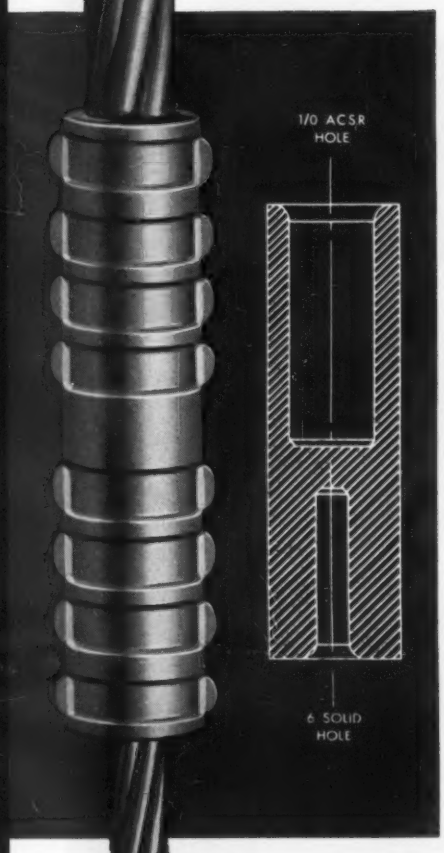
Whatever your transformer problem, contact your Moloney representative for the benefit of more than sixty years experience in solving problems related to the design, manufacture and application of transformers. MEPP-10

COMPANY

and Electronic Applications

AT ST. LOUIS 20, AND TORONTO, ONT., CANADA

You get HIGHER CONDUCTIVITY with BLACKBURN SERVICE ENTRANCE SLEEVES



because Blackburn...and Blackburn alone...provides GREATER CONTACT AREA where needed

Hole Depth Increases With Size of Conductor...thereby providing more contact area for the conductors being connected.

COLOR CODE	WIRE SIZE ACSR	WIRE SIZE AWG	HOLE DEPTH IN INCHES
Brown	–	8 sol — 10 str	.820
Green	–	6 sol — 8 str	.840
Blue	6	4 sol — 6 str	.860
Orange	4	2 sol — 4 str	.925
Red	2	1 sol — 2 str	1.010
Yellow	1/o	1/o str	1.185

The center stop in a Blackburn Sleeve is a solid barrier that assures proper distribution of the inhibitor around the conductors.

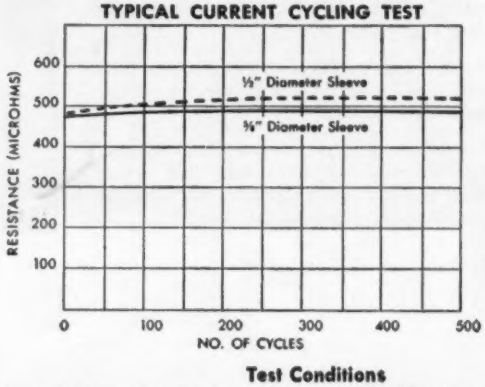
FIRST! Printed (not indented) permanent COLOR CODING is *easier to read*—makes size identification positive and quick.

FIRST! Aluminum Sensitized Tape seals the Blackburn Sleeve's ends. Easy to puncture...and, if a particle of the seal is pushed into the chamber, it is conductive.

FIRST! Each Blackburn Sleeve contains the superior Blackburn inhibitor, Contax, *in measured amount*. Won't squirt out on glove or in face.

LIVE BETTER ELECTRICALLY

Conductivity of Connection PROVED GREATER Than Equivalent Length of The Conductors Being Connected.



A series of typical current cycling tests were conducted with both ½" x ⅜" diameter BLACKBURN Sleeves. Note the lower resistance of Blackburn Sleeves as compared to the equivalent length of cable without any sleeve.

Test Conditions

Wire: 2 ACSR to 4 stranded copper
Current: 190 Amperes
Cycle: 2 Hrs. "On" 1 Hr. "Off"
Length of Connection: 24 inches
Curves represent an average of five tests
Resistance of equivalent length of wire: 527 Microhms

JASPER BLACKBURN CORPORATION, 1525 Woodson Rd., St. Louis 14, Mo. • WYdown 3-9430

ACKNOWLEDGED LEADERSHIP IN DEMAND MEASUREMENT

Install Lincoln Type PW on growing loads

This new polyphase Lincoln watt demand/watt-hour combination meter is your logical choice for installations where future load growth is expected. The dual range feature permits changing the capacity of the demand element in service by simply moving two readily accessible link connections and interchanging the demand scales. Recalibration is not necessary after the changeover.

Class 100 Type PW Meters are available with dual demand ranges of 24 and 48 kw, and Class 200 with ranges of 48 and 96 kw. Meters are also available with universal scales and multiplier plates marked according to the selected range.

Ask your Sangamo Representative, or write for full information about the many advantages these compact, versatile Lincoln demand meters can offer.

A screwdriver is the only tool needed to change the range. Just move the links from "L" to "H" to increase range and interchange the doweled scale plate.

SANGAMO Electric Company

SPRINGFIELD, ILLINOIS

SM58-7

Why You Get HIGHER EFFICIENCY in a RILEY TURBO FURNACE

The Riley Turbo Furnace, a new concept in furnace design, has created unusual interest in the power industry. Already, in only a few short years since its introduction, twenty-three Turbo Furnace units with a total steam capacity of 14,000,000 lbs/hr have been bought by public utilities and industrial companies. Sizes range from 125,000 lbs/hr to reheat units of 1,650,000 lbs/hr and are being installed for the most part as multifuel units to burn oil, gas and coal. Three units are already successfully burning the newest of petroleum by-products fuels: Fluid Coke.

One of the most attractive features of the Turbo Furnace is its high furnace efficiency. Firing of fuels at the bottom of the circulation system makes possible full utilization of furnace waterwall surfaces from top to bottom and permits higher heat release per square foot of furnace envelope. Vertical displacement of furnace gases results in clean, slag-free furnace surfaces and a uniform distribution of furnace heat across the entire width and depth of the furnace.

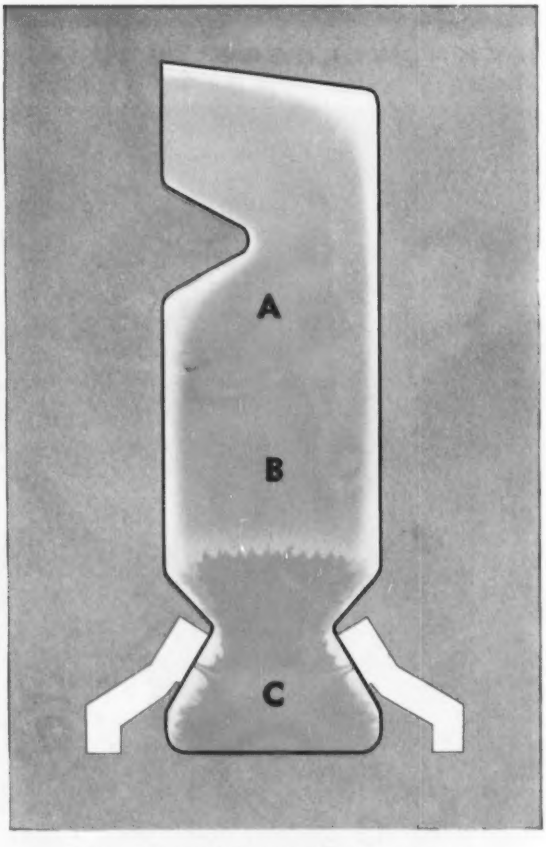


Fig. 1. Flame and Furnace Gas Characteristics of the Riley TURBO FURNACE

High Furnace Turbulence
High Burn Out Rate

As can be seen in the furnace cross section, Figure 1, air and fuels enter the combustion zone of the Turbo Furnace in a downward linear direction from Riley Intertube Directional Flame Burners arranged for opposed firing across the width of the furnace. The opposed streams of fuel and air intermix in the center of the furnace (over the slag pool when pulverized coal is burned) to produce a highly, turbulent area of combustion which fills all the area below the furnace throat. Long residence time of fuels in the area results in a negligible loss of combustibles.

A survey of your plant by a qualified consulting engineer could show ways of making surprising savings in your power costs.

RILEY
STEAM GENERATING & FUEL BURNING EQUIPMENT

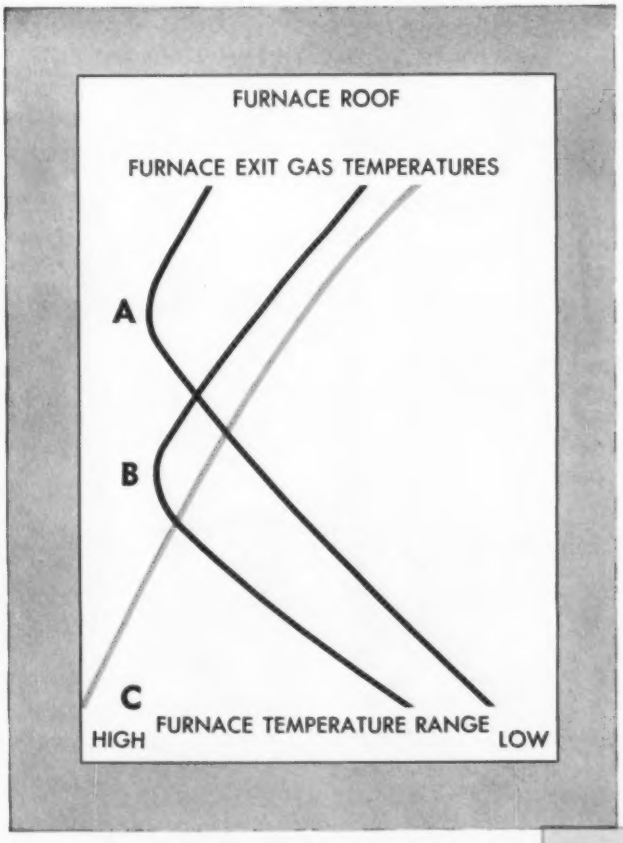


Fig. 2. Furnace temperature curves resulting from heat concentration at various furnace levels. (A) Above center of furnace (B) below center of furnace (C) bottom of furnace

Clean Furnace Walls — No Slagging

Since combustion takes place almost entirely within the furnace bottom very little flame ascends into the upper portion of the furnace. Gases rise vertically without impinging on furnace walls. Heat is released as gases travel toward the furnace exit, cooling to the point where danger of slagging of high temperature elements is reduced to a minimum.

Uniform Heat Distribution At Furnace Exit

A desirable characteristic of furnace performance particularly in larger boilers with wide furnaces is the even distribution of heat across high steam temperature components. In wide Turbo Furnaces this uniformity is furthered by the use of radiant tube platens.

Uniform Furnace Exit Temperatures With Multiple Fuels

The similar flame characteristics of oil, gas or pulverized coal, the completion of combustion in the confines of the furnace bottom, the cooling effects produced by the full utilization of furnace waterwall surfaces result in (1) uniform furnace exit gas temperatures with a given heat release per square foot of effective radiant surface and (2) a marked similarity in the exit temperature of the three fuels (Figure 3). These characteristics make possible the arbitrary use of gas, oil or a wide range of coals with a minimum amount of steam temperature control.

All Burners at Operating Floor Level

Another feature of the Turbo Furnace about which operating engineers are enthusiastic is the fact that all burners, with their supervision and maintenance, are located on one level. This feature permits the location of firing control on the turbine level.

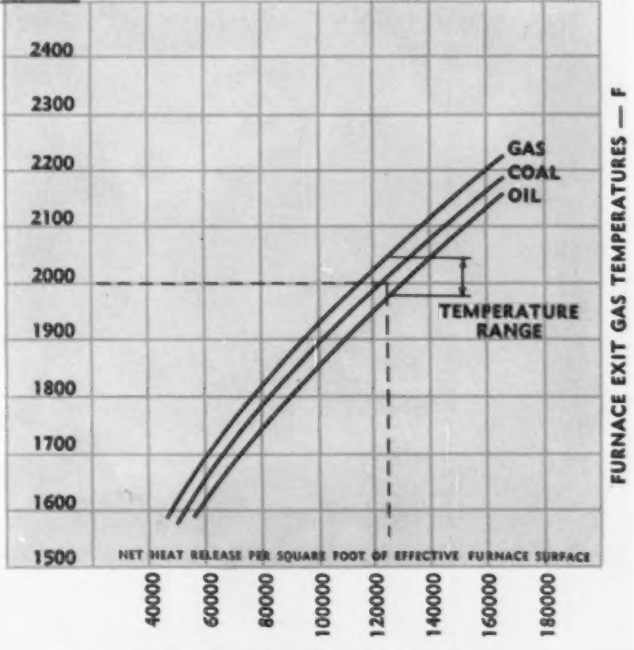
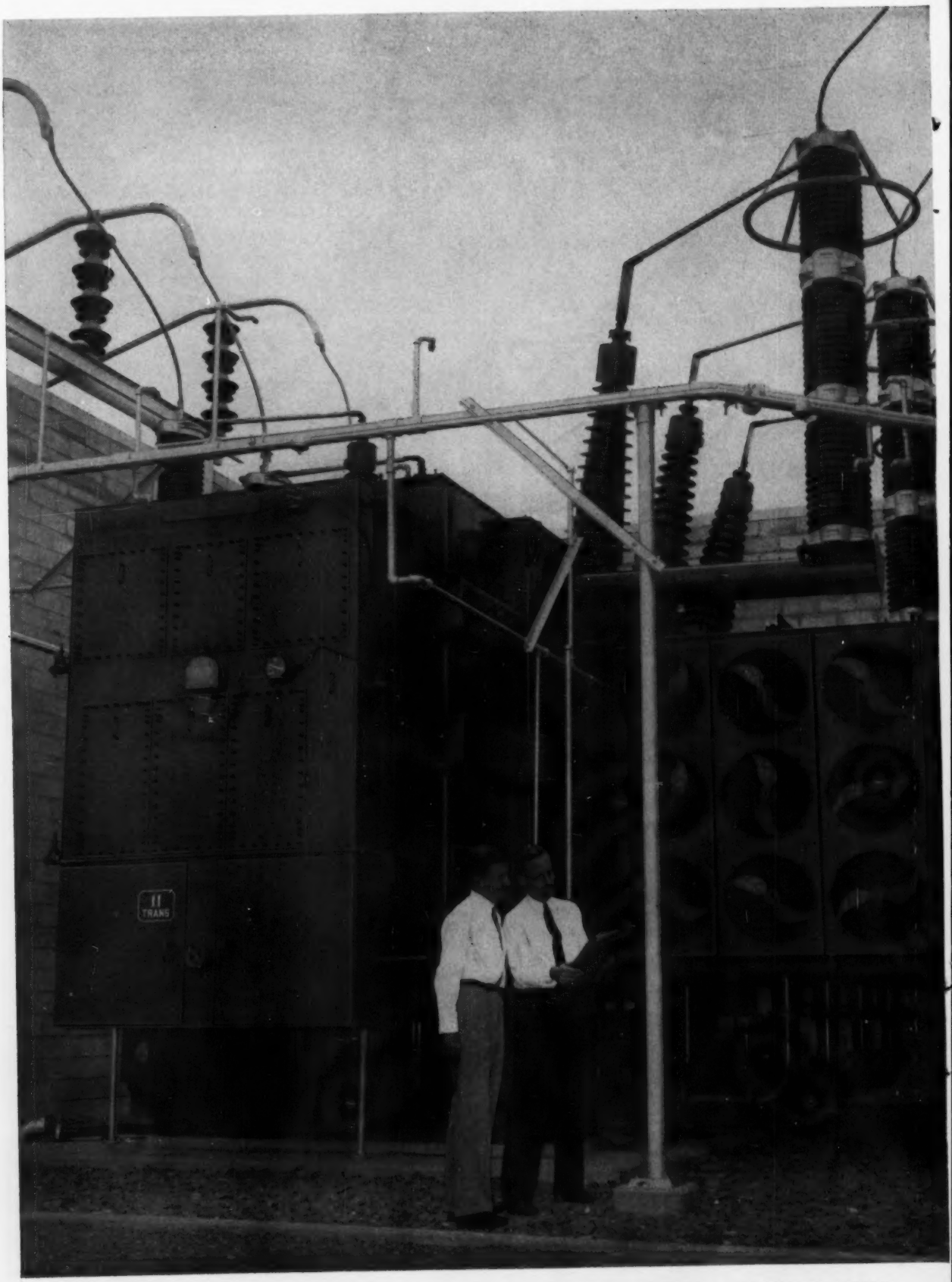


Fig. 3. TURBO FURNACE exit gas temperatures of gas, oil, coal have a maximum variation of approximately 50 F

A Riley engineer will gladly give you complete information about this latest Riley development. Write — RILEY STOKER CORPORATION, WORCESTER, MASSACHUSETTS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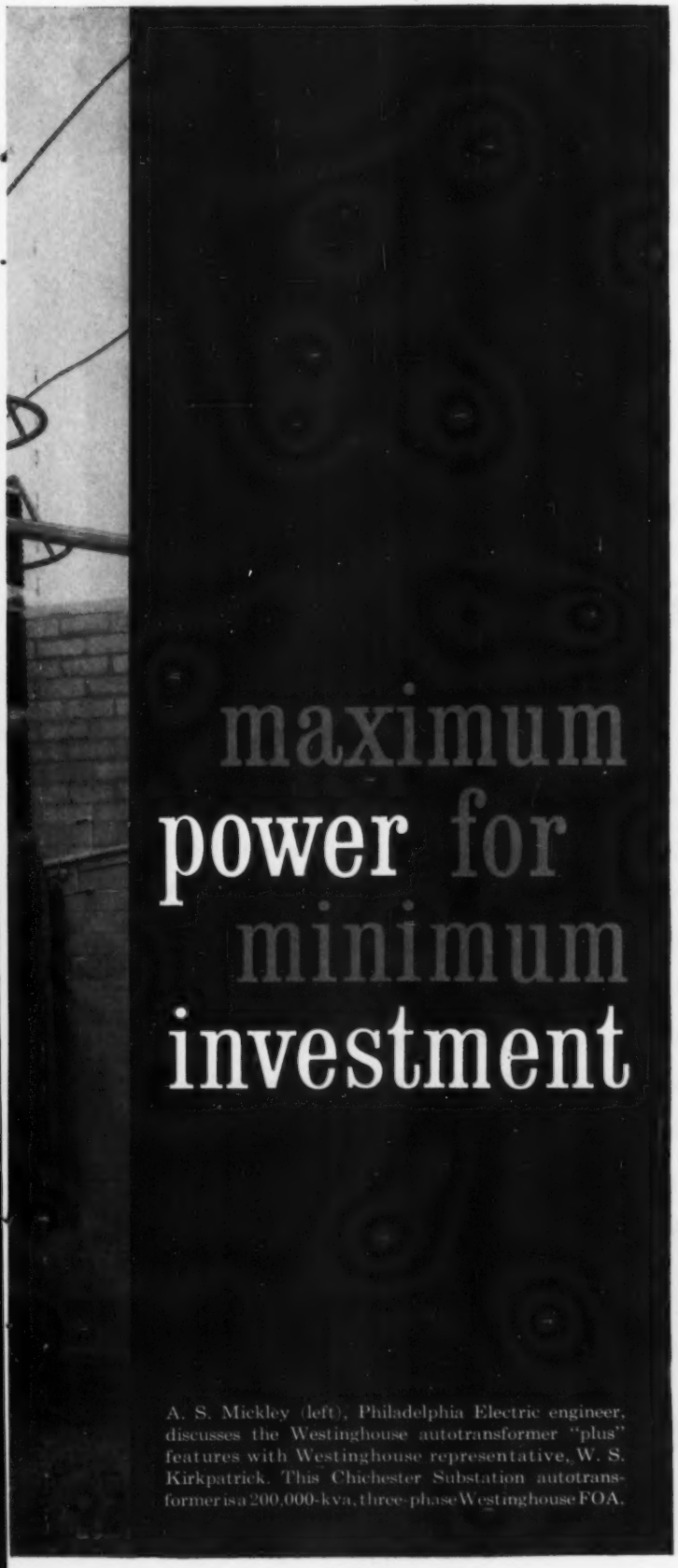
TRANS



A. S. Mickley (left), Philadelphia Electric engineer, discusses the Westinghouse autotransformer "plus" features with Westinghouse representative, W. S. Kirkpatrick. This Chichester Substation autotransformer is a 200,000-kva, three-phase Westinghouse FOA.

How Westinghouse autotransformers help provide ECONOMIC system interconnection

Westinghouse autotransformers have gained wide acceptance for economic interconnection of different voltage systems. A recent example of this is the installation at Philadelphia Electric Company's Chichester Substation of a tie transformer between their 230- and 138-kv systems.

Early interest by Westinghouse engineers in the problems of interconnection led to the development and improvement of the Westinghouse autotransformer . . . helped provide today's *economic* system interconnection—maximum power for minimum investment—with:

- Reduced initial cost
- Reduced losses
- Reduced impedance
- Reduced weights and dimensions
- Improved regulation

Westinghouse leadership in autotransformer design has been maintained by continuous development of those features which best serve the electric utilities—development made possible through earnings plowed back into research and engineering. Here are a few of the big developments first incorporated and now available in Westinghouse transformer design:

Shell-form, Form-Fit® construction—superior mechanical and dielectric strength.

Forced-oil cooling—extended service life, increased overload capacity, low pressure, high-volume oil system with vertical ducts.

New Inner-Cooled construction—lower impedance, improved performance, up to 25 percent space and weight reduction.

New Insuldur system*—10 percent more overload capability—economically and safely.

For the full story of how all these Westinghouse developments are built into Westinghouse autotransformers to help provide *economic* system interconnection, call your Westinghouse representative . . . or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-70894-R

*Trade-Mark

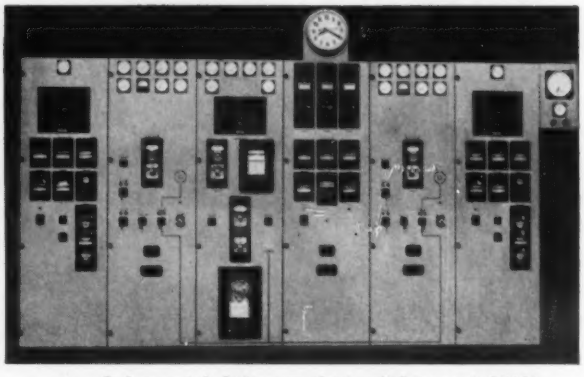
YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

in metal-clad switchgear...

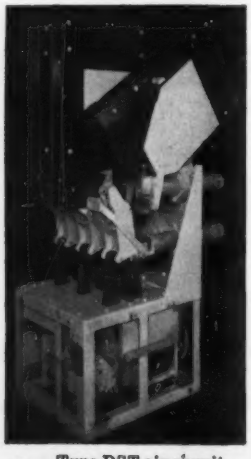
Reliability

is born of many men's efforts



Indoor metal-clad power plant switchgear rated 4160 volts, 3 phase, 60 cycles supplied to a partially attended generating station.

It started with a directive—"Make it the best!" A creative team set out to implement this decision. Engineers, designers, production men, and marketing personnel—all took up the challenge. What was *then* good gave direction. They added their talents, their skill, their experience—up-to-date application requirements—designing, testing, redesigning until drawing board plans were translated to market place reality. Out came metal-clad switchgear preeminent in strength, simplicity, and performance. They *had* made it the best!



Type DST air circuit breaker—5 kv, 250 mva, 1200 amps.

From simple feeder circuits to complex generating station protection—when you specify Federal Pacific metal-clad switchgear, you specify reliability. Proof is yours for the asking. Write Federal Pacific Electric Company, Newark, New Jersey for Catalog 3-440—sixty-four pages of the latest in metal-clad switchgear information.

FEDERAL FPE PACIFIC

The Best in Electrical Distribution and Control Equipment

The Electrical Week

FUTURE NEWS ▶ **Will the next Congress tax co-ops?** It's a possibility as soaring budget deficit will send Solons searching for more revenues.

LATE NEWS ▶ **AIEE's Fall General Meeting has been cancelled** because of hotel strikes in Pittsburgh. Papers will be considered to have been presented, and will be distributed as AIEE official literature.

Diesel oil may be used as coolant and moderator in a 50-Mw nuclear power plant Westinghouse has under study for Burlington, Vt., Electric Light Dept. Uranium oxide pellets will be used as fuel. Circulating oil will remove heat from core and then heat-exchange it to steam turbine cycle.

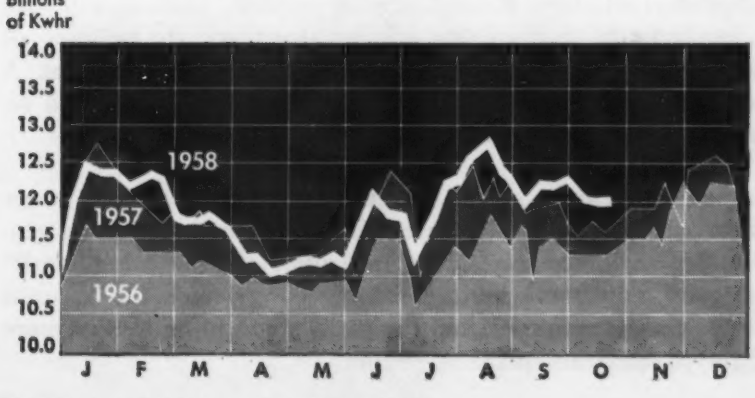
Engineers Joint Council completes engineering-salary study. Publication in about a month. Orders are being taken by EJC, 29 West 39th Street, New York 18, N. Y. Cost is $3.00 per copy.

REA reports new record high in percentage of U. S. farms receiving central station power—95.4%.

Manufacturers news . . . Eight interchangeable high voltage bushings between power transformers and circuit breakers will be available from GE in 23-196 kv range in early '59 . . . A transformer with a two-winding capacity of 404 Mva—called the world's largest—is on the Allis-Chalmers drawing board for Commonwealth Edison . . . Solution to temperature limitations for electric motors is seen in new "hot rock" Westinghouse insulation. Researchers reported ½-hp motor in operation at 1,240 F without signs of distress.

Management change . . . Phelps Dodge Copper Products Corp transfers Carl D. Dimity to New York as assistant vp-sales.

POWER OUTPUT—UP 3.1% (Week ending Oct. 18), Kwhr 12,048,000,000



Per Cent Change From Previous Year

	Oct. 4	Oct. 11	Oct. 18
Total U. S.	+4.7	+3.1	+3.1
New Eng.	+5.4	+4.7	+2.2
Mid. Atlantic	+4.5	+2.0	+2.8
Cent. Ind.	+3.8	+1.6	−0.3
West Cent.	+5.0	+4.1	+1.8
Southeast	+4.4	+3.0	+3.5
South Cent.	+8.2	+9.4	+7.6
Rocky Mount.	+4.7	+2.4	+9.0
Pacific			
NW	−0.9	−2.4	−1.0
SW	+9.2	+6.5	+11.8

Seasonally Adjusted Index 236.1

Week Ago 236.0 Year Ago 228.3

Source: Edison Electric Institute

A TWO-MINUTE PREVIEW OF THIS ISSUE

EVENTS ▶ **Comptroller General Joseph Campbell has backed down on several** controversial points in his earlier decision to limit REA in making loans to co-ops for serving new customers. But he stuck to his guns on others. Read details in this week's lead news story **(p 58).**

Labor negotiations continue quietly. Prospects for a peaceful settlement look good. Activities center largely about "savings and security" plans offered by GE and Westinghouse **(p 59).**

SPECIAL REPORT MODERNIZATION OF SERVICE FUNCTIONS ▶ **Modernize service functions to meet future growth.** The fourth of Electrical World's five special reports urges utilities to ready those service functions—accounting, materials management, communications, buildings, vehicles—which they will need to meet the growth resulting from the coming boom of the Sixties. EW Editor Frank Kovalcik pegs these five areas for special attention:

The use of computers to streamline handling utility data. Electronic data processing (EDP) is revolutionizing utility accounting and power system engineering. Already 24 utilities have adopted stored-program digital computers to upgrade their accounting operations in anticipation of future growth **(p 66).**

Modern methods in materials management to hold costs in line. Plans to handle the more than 40% increase in materials and equipment necessary for industry growth demands in five years include newer, more efficient buildings and greater mechanization to supplement manual methods **(p 69).**

The need for better communications. The big jump in the volume of information to be exchanged within utility systems spells faster, more efficient and reliable communication methods. Microwave and space radio will have larger roles on systems. Although carrier communications have had their day, their use will continue **(p 72).**

More operating space gained by putting up new buildings. To match its own growth predictions, the industry will have to expand its headquarters activities. Room is the big problem. Utilities will have to solve it by (a) modernizing existing structures; (b) building or leasing new space downtown; and (c) going out to the suburbs. A study of 19 utilities reveals they put up 82 new buildings and revamped another 20 in the last five years **(p 74).**

Using special vehicles to cut operating costs. Efficiency and lower costs in operating utility fleets are being gained both by leasing general and special-purpose vehicles and equipment and using "small" passenger cars. At present fleet leasing covers some 15,000 units operated by 40 companies, and the trend seems to be toward more of this type operation **(p 78).**

MANAGEMENT ▶ **General business outlook is bright.** It's still too early to make any cast-iron predictions for '59, but these marks are clear on the economic barometer: The recession "valley" is being filled in—GNP is up $11 billion for third quarter, wiping out about 2/3rds of the recession loss. Industrial production is up another point. Steel is consistently above the 70%-of-capacity mark. September's personal income was at a record $356.1 billion rate. Unemployment down to 4.1 million last month (p 103).

SELLING ▶ **Detroit Ed uses separate metering to get electric heating costs.** Using records from some 35 metered homes, DE has been carefully calculating heating costs, load factor, kwhr per Btu/hr and kwhr per degree-day per Btu/hr losses (p 107).

MANUFACTURERS ▶ **Two million lb of aluminum will be in Alcoa's generating plant** now being built at Evansville, Ind. The 375-Mw Warrick plant, owned by Alcoa Generating Corp, will be operated by Southern Indiana G&E . . . Aphonic enclosures cut transformer sound levels on five 70,000-kva, 138-69 kv GE units for Con Ed to 50 db, 30 db under NEMA standards . . . Profit margins in the past five years of the Canadian electrical manufacturing industry have averaged only 3.2%, says retiring CEMA President T. J. Bell . . . Babcock & Wilcox steam generating equipment at Iowa EL&P's Sutherland station will burn low-heat, high-ash and sulphur Iowa coal (p 87).

NEW EQUIPMENT ▶ **Center break side switch is available** in voltage ratings of 34.5 to 161 kv and continuous current ratings of 600 to 1,200 amp . . . Distribution transformer is designed specifically for underground residential/commercial service . . . Stringing sheave has permanently bonded neoprene liner (p 92).

PEOPLE ▶ **E. H. Will becomes president** of Carolina's Virginia Nuclear Power Associates. O. J. Miller is re-elected executive vp . . . Louisville G&E promotes B. Hudson Milner to executive vp and Fred B. Tetzel to vp in charge of sales, public relations, and advertising . . . Delta-Star Electric Div of H. K. Porter Co appoints the following: H. Yale Mageoch to director of engineering and research, A. K. Alasker to chief engineer; R. W. Dixon to manager of Electric Service Works, and C. R. Billman to assistant manager (p 108) . . . Max M. Ulrich is named general manager of advertising and industry research for Consolidated Edison (p 110).

NEXT ISSUE ▶ **Modernize industrial plants and street lighting** will be the subject of next week's special report, the last in the modernization "Plan 59" series. Utilities will have to update their industrial customers' service to help combat shrinking profit margins. At the same time they must streamline their street and highway lighting activities for better community relations and profits.

A load-angle limiter secures full negative-reactive output from a synchronous condenser without slipping poles, thereby aiding voltage control. The limiter acts only when instability threatens, boosting excitation to restore synchronizing power. Proper adjustment adds 20% to the machine's negative-reactive output with greatly improved stability. **G. Manchur, Ontario Hydro Research News, April-June 1958.**

TECHNICAL NOTES

Helium is quite useful as a tracer gas in detecting leaks in cables, pipes and pressure vessels. The amount in the atmosphere is insignificant and it is chemically inert and not harmful to cable or other substances.

An excessive quantity of fine sand particles considerably decreases the frost resistance of concrete.

Data logging via microwave will provide intelligence for centralized punch-button control of Philadelphia's water system, paying off $432,000 investment by eliminating operators' salaries at pumping stations. System will measure and transmit pressures, levels, and water flows from 92 points to an automatic typewriter for permanent printed record. Simultaneous visual indication at a console will enable dispatcher to regulate the water system with supervisory controls.

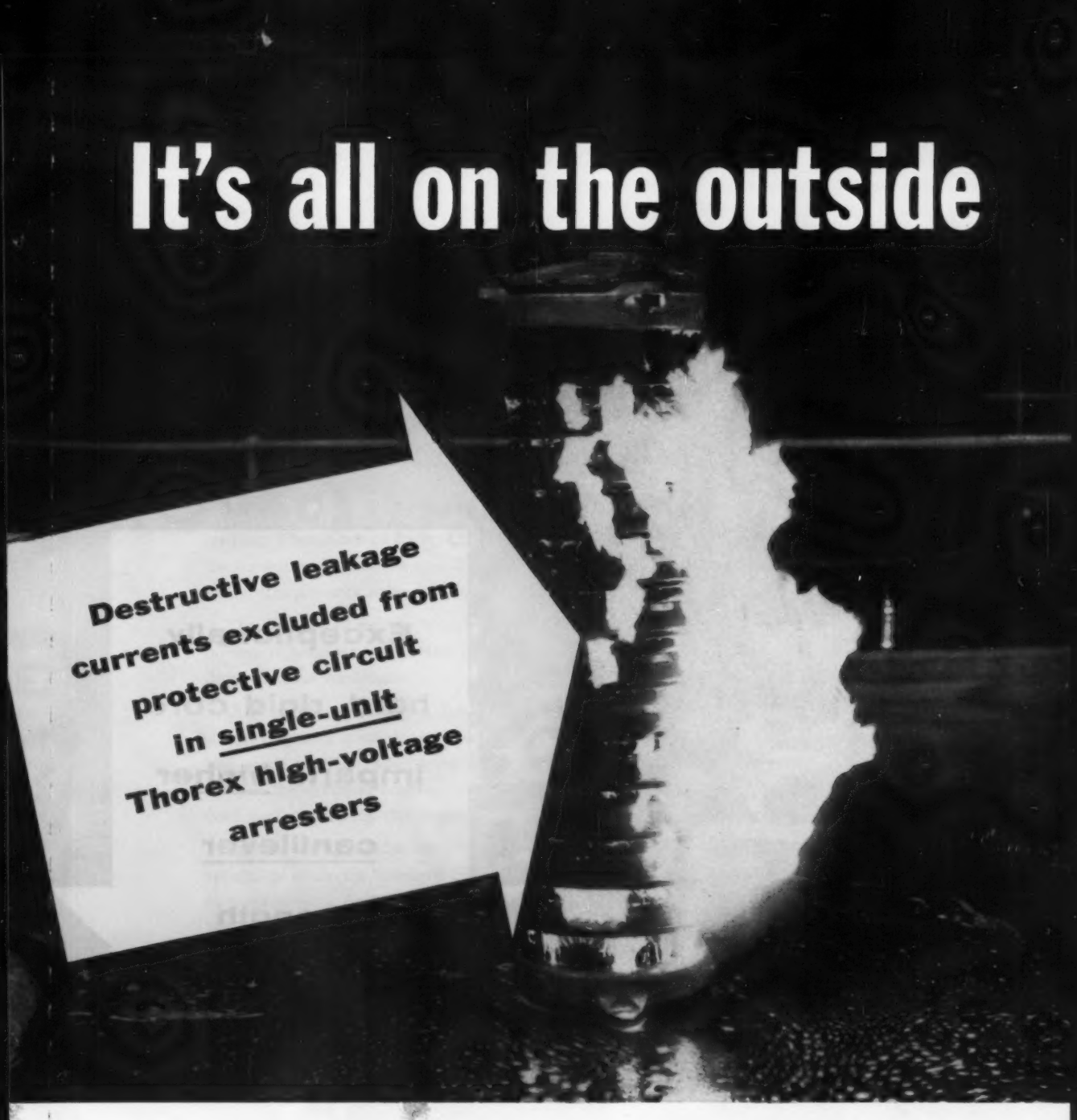
Eighty-five percent of the total activity diffuses out of impregnated graphite nuclear fuels in 4 to 6 hours if they are heated to 2000C during fuel reprocessing. It thus appears possible to reimpregnate and reuse the same fuel element several times or until radiation damage to the graphite matrix makes complete chemical separation necessary.

Reactive power cannot be transmitted over dc lines from the sending to the receiving system. Both rectifiers and inverters at the respective ends of the line represent lagging power factor loads to the connected ac systems.

FROM EDITORS IN THE FIELD

Semi-outdoor boiler design, standard in the U. S., will be incorporated in the design of the Willington Station in Great Britain. The four-unit station layout is also unconventional. It is in the form of an "H" with the four boilers grouped together in facing pairs to form the cross leg of the H and with two turbines in line on each side.

It's all on the outside



One-piece -- *single unit* -- construction of all Thorex Dynagap high voltage lightning arresters remedies the basic cause of contamination damage. Destructive leakage currents bleed harmlessly to ground over the outside surface. They can never reach the sensitive internal protective circuit because there are no inter-unit stacking connections. Even this severe contamination and wetting condition, leading to external flashover on laboratory test, has no effect on internal elements, or protective performance. More than one inch of continuous radial porcelain insulation protects the arrester circuit.

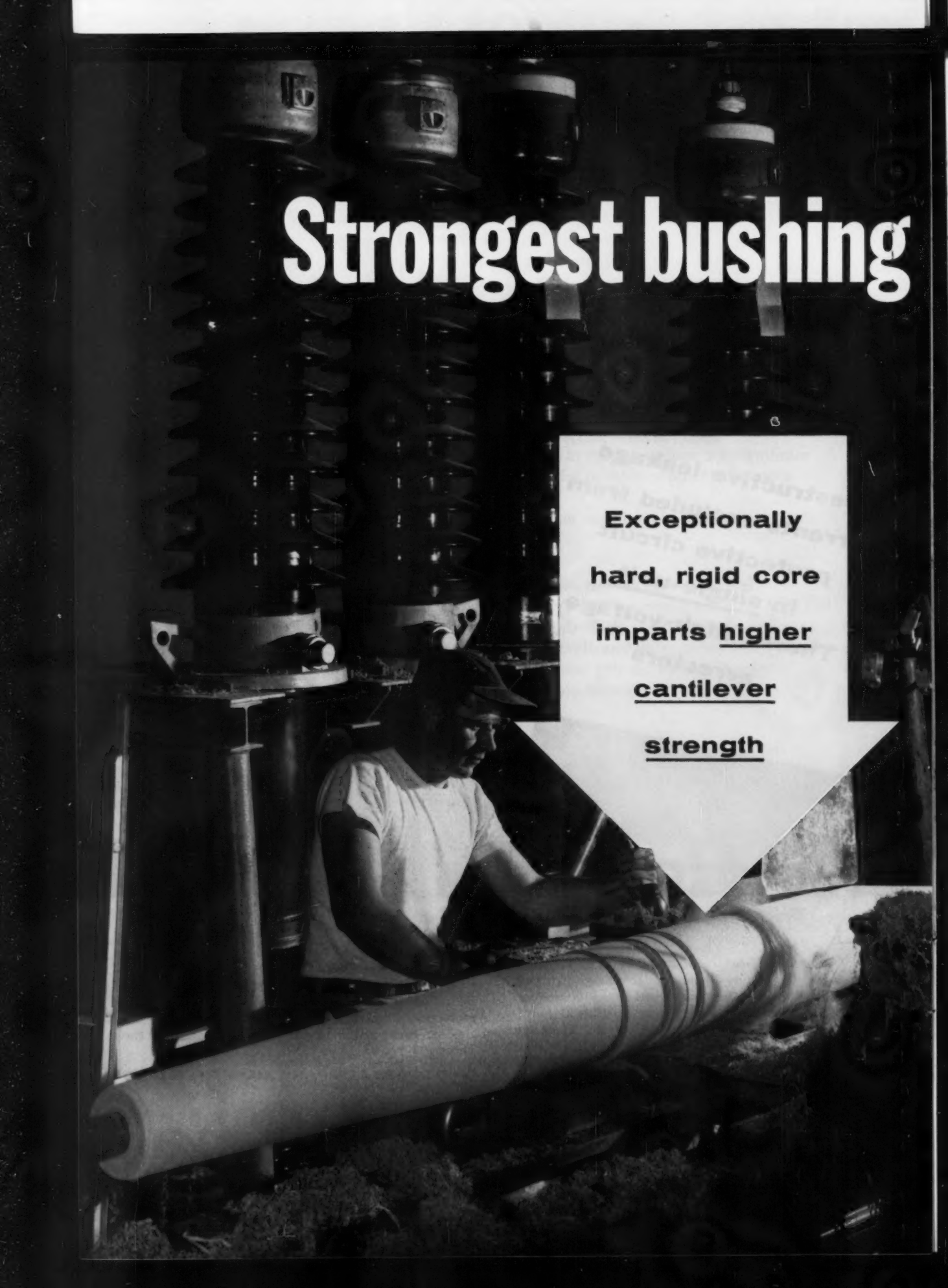
By this extremely simple and dependable improvement, lightning arrester reliability in districts of heavy contamination has been increased many-fold.

For an entirely new order of station equipment protection, install the only arrester offering you single-unit construction at all higher voltages -- the Thorex Dynagap, Type-MPR.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

4911-H


Strongest bushing
Exceptionally
hard, rigid core
imparts higher
cantilever
strength

we've made in 50 years!

Hard, rigid, strong as an oak log - - the insulating core of an O-B condenser bushing. Thousands of layers of paper are compacted into a dense mass on the newest, most modern core-wrapping machines in the industry. Mechanically, this presents an exceptional opportunity.

The practice of merely "floating" the core within its surrounding oil and porcelain housings, supported only at its two extremeties, imposes extra duty on these housings.

O-B design reverses this. Inherent strength of the core is exploited. At strategic points, solid contacts are made between housing and core. The two work together. Cantilever strength factors are materially benefited. Result: the strongest bushing O-B has made in some 50 years of satisfactory field performance in this important category.

Rugged strength helps keep 'ruptor parts in line, and adds to the over-all reliability of circuit breakers. High durability imparts added safety factors to transformers. And - - important in all applications - - this strength gives better assurance of the bushing arriving on the job in factory condition, despite the shocks of transportation and handling.

It takes only a word, spoken or written, to get this extra money's-worth. Simply be clear about one thing - - "O-B" - - in requesting the bushings to be delivered with your new station equipment.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

4912-H

NAME IT

...and you can have it!

You can get O-B Insulation on new switches and package substations *if you ask for it*— your own records will justify the slight trouble

Some people think all switch and bus insulators are alike. *Do your own records say this?*

You can find out, in your own office, from information gathered on your own terms, and free from all salesmen's claims, just how *unlike* switch and bus insulators may be. You can tell when they were installed, what replacements, if any, have been made, and why.

If your experience is typical, you will discover that O-B insulators have consistently out-lived others. Since prices are similar, this means you got better mileage on your invested capital. You also saved the time, cost, and inconvenience of repair work.

Switchgear and package substation manufacturers don't know what insulator you prefer *until you name it*. Specify O-B. Your own records will justify this small extra trouble.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

4897-H

BODIES AND POWER EQUIPMENT DESIGNED AND MANUFACTURED BY ONE COMPANY---HOLAN

Order bodies and equipment from one source . . . where the responsibility for design, workmanship and warranty rests with one company.

ELBOWS

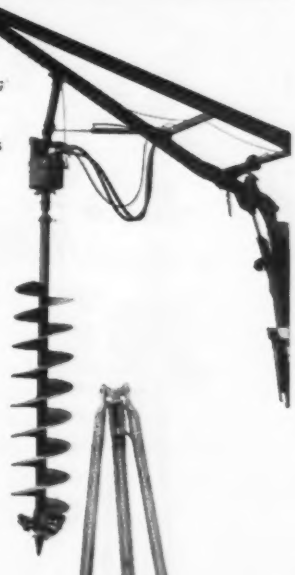
Single- and twin-bucket units with exclusive cable-type control system. For street lighting, tree trimming, transmission, distribution and telephone work. 360° continuous rotation.

HOLAN MAKES UTILITY, LINE CONSTRUCTION AND SERVICE BODIES—

all of high-tensile steel

EARTH BORERS

Two- and 3-speed. Portable; hydraulic or mechanical. Augers for 8″ to 30″. Dig holes 10′ deep. Power feeds for full line of hydraulic derricks.



TWO-LEGGED DERRICKS

Series 6800 for more power in low ranges; lifts 8,000 lbs. (extendible boom head is optional). Bow-legged Series 6700 also lifts 8,000 lbs.

JACKS

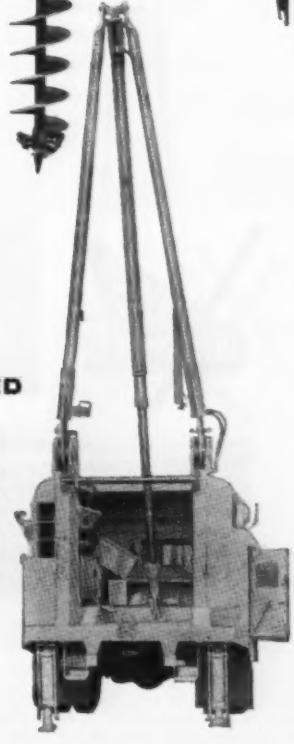
Mechanical or self-stowing hydraulic jacks with 14,000-lb. capacity. Controlled from rear of truck.

LADDERS

To 40′ with all phases completely hydraulic. Also mechanical ladders and manually-operated hydraulic ladders. Elevations to 75°, 360° rotation.

THREE-LEGGED DERRICKS

Series 3700 for heavy work. Lifts 12,000 lbs., body-loads 5,000 lbs., handles 75′ poles. Series 5700—available with automatic side leg coupling — has 6,000-lb. capacity.



TOWERS

Hydraulic to 30′ high. Rotary, stationary or transverse platforms. Two- and 4-section and exclusive 5-section box-girder telescoping masts.

J. H. HOLAN CORPORATION

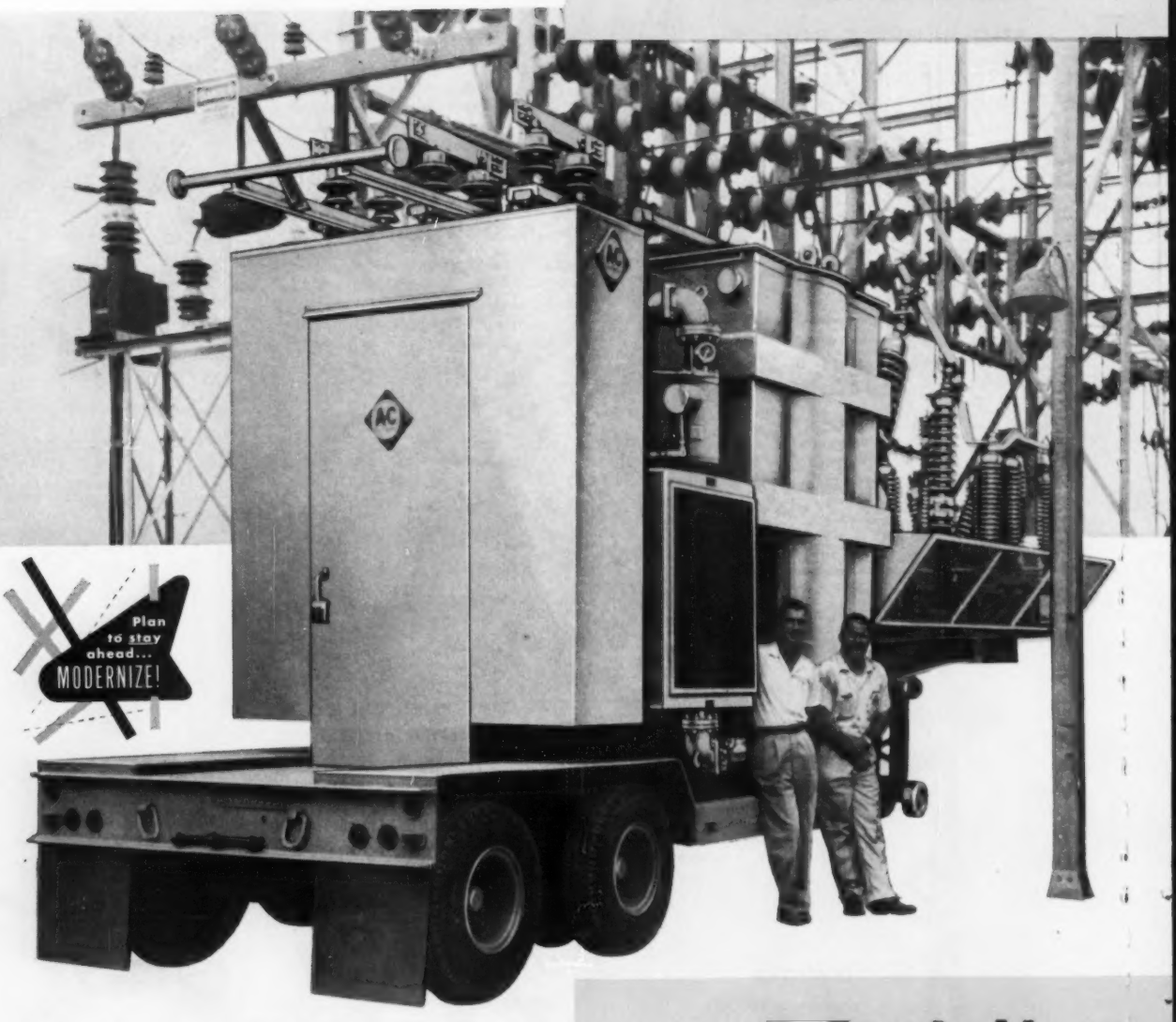
4100 WEST 150TH STREET
CLEVELAND 35, OHIO

OTHER PLANTS: **HOLAN CORPORATION OF GEORGIA**, Griffin, Ga.
J. H. HOLAN CORPORATION, PHOENIX DIV., Arizona
BRANTFORD-HOLAN LIMITED, Brantford, Ontario

THE NAME THAT MEANS WORK SIMPLIFICATION

ALLIS-CHALMERS

POWER



Mobile

ALLIS-CHALMERS

on wheels

Allis-Chalmers Mobile Substations

Modern Solution to: **Power Failures**

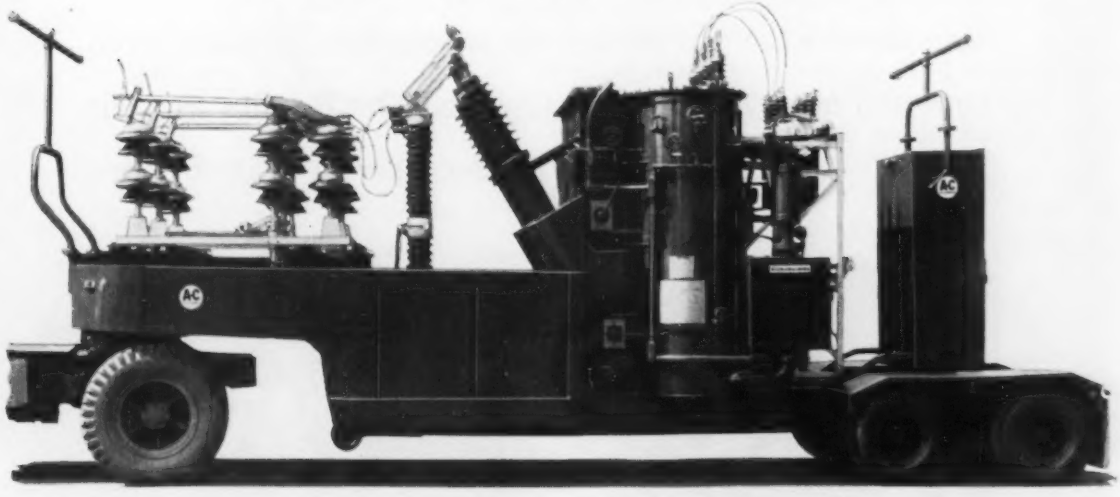
. . . Bypassing Substations

. . . Temporary Loads . . . New Loads

The mobile substation is fast becoming indispensable equipment for utilities. "Power on wheels" has not only proved its worth in quick restoration of service in emergencies, but has also proved a valuable help in maintaining everyday service continuity under circumstances which ordinarily impair or disrupt service.

The sturdy Allis-Chalmers mobile unit is a complete substation — it includes: transformer, high voltage switch, lightning arresters, fuses, and low voltage switchgear.

Call your A-C man for a detailed description of this modern mobile unit, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



Substations

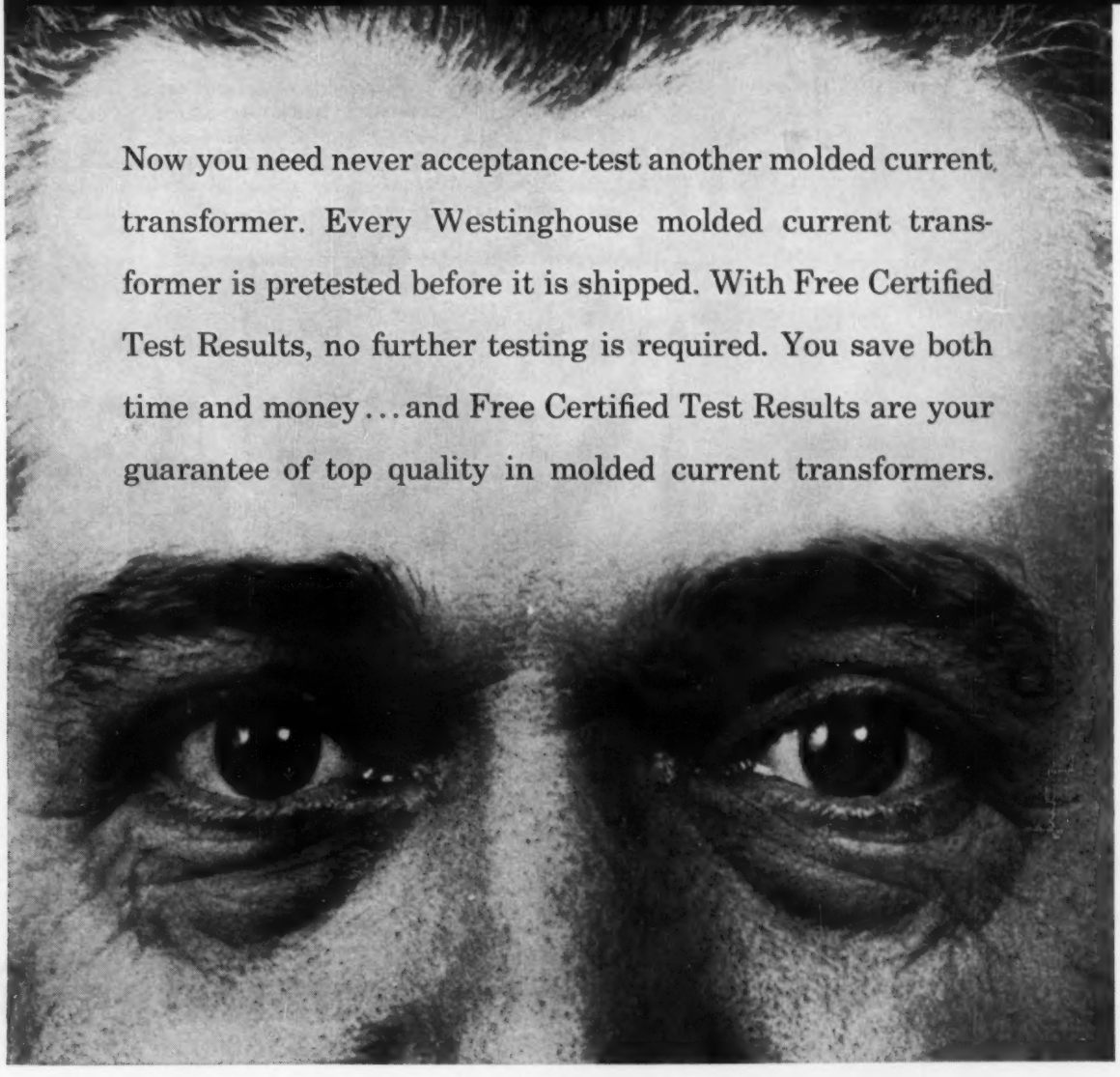
Standard basic designs are available for Allis-Chalmers mobile substations through 10,000 kva, 69 kv and below. These units may have two or three high voltages and several low voltages connectable either delta or wye.

For larger mobile substations, special design considerations may be required.

ALLIS-CHALMERS

A-5844

are you among the 88 utilities saving money with free



Now you need never acceptance-test another molded current transformer. Every Westinghouse molded current transformer is pretested before it is shipped. With Free Certified Test Results, no further testing is required. You save both time and money... and Free Certified Test Results are your guarantee of top quality in molded current transformers.

certified test results?

Eighty-eight utilities across the country have discovered the time- and money-saving plusses of Free Certified Test Results. Here's what some of them say:

". . . a fine idea, and we will take immediate advantage of it. This will eliminate testing in our central division and reshipping; it will save us between $2 and $3 per unit."

"We have tested your EMR and verified results with your Certified Test cards. We are informing our divisions that testing of Westinghouse current transformers is no longer necessary."

"The Certified Test has made it possible for our company to eliminate the expense of shipping these transformers into a central laboratory for testing, then reshipping them to each of the District offices as required. Shipments can now be made direct to the area where they are to be installed."

"It is no longer necessary to test Westinghouse EMR and EMO transformers — a real savings for our company . . ."

Company Number_____

TYPE EMR CURRENT TRANSFORMER CERTIFIED TEST DATA

Serial Number	5.7A	275 56
Nameplate Ratio		200/05
Date of Test		11 14 57
Insulation Test Results		T000 00
Phase Angle And % Ratio — 100 % Current B 0.2 Burden	1.6+	100.10
Phase Angle And % Ratio — 10 % Current B 0.2 Burden	6.3+	100.25

(See reverse side for interpretation of data)

The above is a true record of actual tests made on this unit at the Sharon Works of the WESTINGHOUSE ELECTRIC CORPORATION.

Luis W. Yochum

"Our actual test results on all 48 EMR transformers confirmed the accuracy of your Certified Test report within 1/10 of 1%."

". . . a good idea . . . will save real money for us."

"Our operating department has recommended that we stop testing and accept your molded line as received."

"Your Free Certified Test Results . . . will save us $3.50 per transformer . . ."

". . . a definite advantage and a cost-saving extra in current transformers."

"This is the best thing that has happened in instrument transformers in a long time."

THEY ALL HAVE IT...

All Westinghouse molded current transformers carry the Certified Test Results record. This includes the SM line, molded of silicone rubber, and the 600-volt class, molded of polyester elastomer, a product of Westinghouse research.

Is your company among the 88 saving time and money with *this* Bonus Value? Free Certified Test Results are another example of the Bonus Values made possible through Westinghouse earnings reinvested in research and development. J-70893

YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

Automatic carousel testing minimizes possibility of human error. Test results are printed on a 3 x 5 file card. This accurate record is given you for your files — another plus from Free Certified Test Results. This test data should satisfy your state PUC requirements.

New for you...

International Trucks

NOW! A really comfortable six-man cab and rugged INTERNATIONAL chassis factory-matched one for the other!

INTERNATIONAL TRUCKS

Choice of cab-forward or conventional models to match your job. See your INTERNATIONAL Dealer, today!

INTERNATIONAL **model AC-160** with Travel-Crew cab and public-utility body. Gross vehicle weight up to 33,000 lbs.

with *Travel-Crew* Cabs!

NOW plenty of room for six! No crowding. Full-width front and rear seats measure five feet plus, door-to-door. Third door access to rear seat provides easy in-and-out. You move crew, materials and tools to job site in one operation, in all-weather comfort.

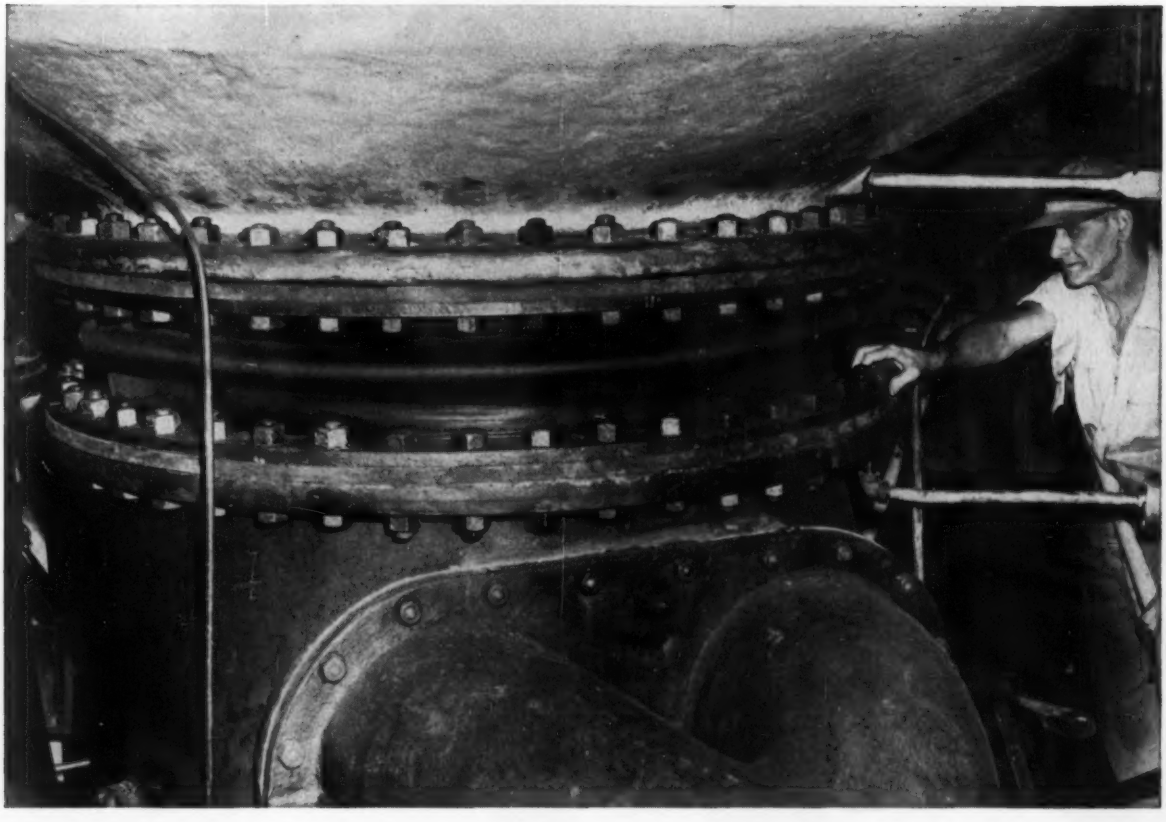
NOW save time and money! No need for the delays of field conversion to a crew cab. One order to your INTERNATIONAL Dealer delivers a factory warranted, work-ready truck with Travel-Crew cab for one low *complete-unit* price!

NOW factory-matched construction! Travel-Crew cab and chassis are designed one-for-the-other. Factory-matched on the assembly line to give you a truck that offers precision engineered weight distribution and well-balanced styling for smoother appearance and longer life.

cost least to own!

INTERNATIONAL HARVESTER COMPANY, CHICAGO
Motor Trucks • Crawler Tractors
Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors

US RUBBER EXPANSION JOINTS



For 34 years...

THE OLD JOINT THAT STAYED SUPPLE!

Just how long should a rubber expansion joint keep active? 15 years? 20? 25? Depending on the type of service, any one of these lifetimes would be old age by ordinary standards. But not for U. S. Rubber Expansion Joints.

For instance, the New York, New Haven & Hartford Railroad installed (at its Cos Cob, Conn., power station) one of the first U. S. Expansion Joints ever made. This was in 1924, the first year of Calvin Coolidge's administration. For 34 years, the U. S. Joint gave perfect service, required no maintenance.

When retirement time was finally decided upon, the joint was replaced, of course, by the new U. S. Expansion Joint shown above. Incorporating all the latest developments, this new joint is expected to give a performance worthy of its predecessor.

34 years on a job is just one of the many, many service records chalked up by U. S. Expansion Joints in power stations throughout the world. "U. S." was the first to make rubber expansion joints, and has always been the most reliable source of supply.

When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.

NOTE: We believe this is one of the oldest rubber expansion joint installations in existence. If you know of, and can authenticate, an older one, we'd like to hear about it, and we'll send you a $100 U. S. Savings Bond.

US RUBBER Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.

Turbine in supercritical-pressure steam system uses

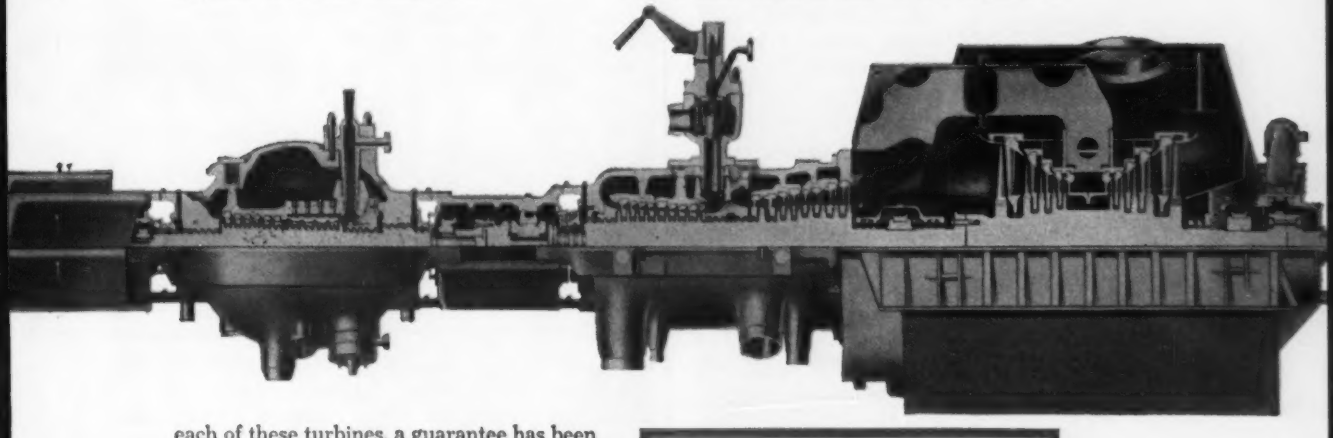
Nonpareil TURBINE OIL

. . . and
American Gas & Electric Power
receives
life-of-turbine guarantee for the oil

A General Electric turbine, for which the main steam pressure is 4,500 psi and the temperature is 1,150°F. has now been in service for more than a year. The performance of this developmental turbine, its associated steam generator and other equipment, indicates that this plant will set the pattern for steam power plants for the future. It is appropriate that the turbine oil is one that has been proved in more than 30 years of service—NONPAREIL.

To achieve new records in efficiency of operation and to accomplish even more efficient generation of electric power, American Electric Power engineering management had to be *sure* of every item of material used in the installation. NONPAREIL Turbine Oil was tested and found fully capable of providing the superior lubrication required by this history-making unit.

Over 1,000 turbines are in service using NONPAREIL Turbine Oil. To the owners of each of these turbines, a guarantee has been issued, which certifies that *for the life of the turbine* the oil will never exceed an acidity level of 0.15 mg. KOH/g. Most often it is in the order of 0.03 to 0.06 mg. KOH/g.



An industrial lubrication specialist in the Standard Oil office near you, in any of the 15 Midwest or Rocky Mountain states, will be glad to give you additional data on NONPAREIL Turbine Oil. Call him. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

Quick facts about
Nonpareil Turbine Oil

- Will not permit formation of harmful acids
- Will not permit formation of sludge or oil varnish
- Will maintain good demulsibility or water separating characteristics
- Has high resistance to foaming
- Contains adequate rust inhibitor

You expect more from STANDARD and get it!

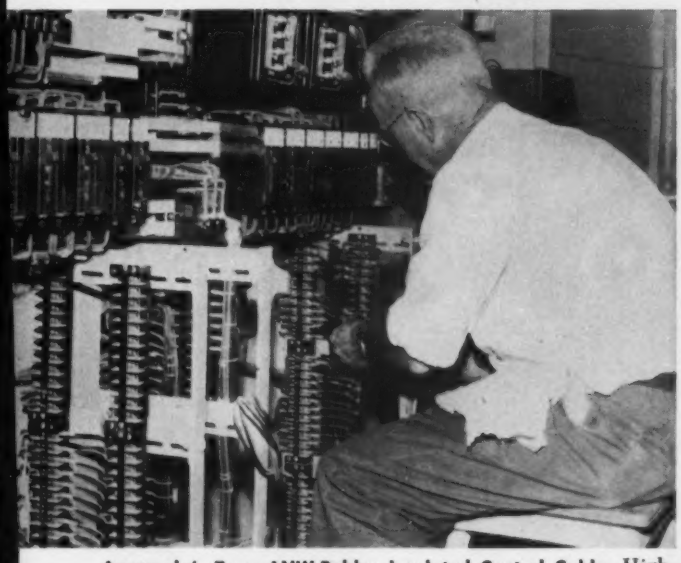
Match the conditions in your plant

TYPE AND VOLTAGE RATING	CHARACTERISTICS	GENERAL APPLICATIONS	INSTALLATION METHODS
RUBBER—Insulated Control Cables			
Rubber-Insulated 600-Volts	The standard Anaconda rubber control cable—with excellent moisture resistance, heat stability and long-aging characteristics.	General-purpose and station control requirements of utilities and industrials.	Can be installed aerially, in conduit, underground in ducts – or buried directly in the earth.
Ozone-Resistant Rubber-Insulated 600-Volts	An ozone-resistant control cable also possessing proved moisture resistance, heat stability and long-aging characteristics.		
THERMOPLASTIC—Insulated Control Cables			
Polyethylene-Insulated 600-Volts	A standard Anaconda thermoplastic control cable with excellent moisture and chemical resistance. Highly resistant to electro-endosmosis. A long-lived cable.	General-purpose control requirements of utilities and industrials.	Can be installed aerially, in conduits, underground in ducts—or buried directly in the earth.
DENSHEATH® Insulated 600-Volts	A standard Anaconda thermoplastic control cable with excellent moisture and chemical resistance. Long-aging performance.		
Anaconda Type PND* Polyethylene-Insulated – Nylon Conductor Cover 600-Volts**	An approved control cable with dependable chemical and abrasion resistance. Features small diameter. Long-aging properties.	General-purpose control requirements of utilities and industrials where space is a limiting factor.	Can be installed aerially, in conduit or underground in ducts.
Polyethylene-Insulated 1000-Volts	A thermoplastic control cable excelling in moisture and chemical resistance. Features heavy insulation thickness. Long-aging characteristics.	Station control requirements of utilities and industrials.	Can be installed aerially, in conduit, underground in ducts – or buried directly in the earth.

**IPCEA voltage rating is 300 volts.
*Trademark

Lead sheaths are furnished on rubber-insulated control cables if requested.
Interlocked armor is available for all types of control cable.

with these Anaconda Control Cables



Anaconda's Type ANW-Rubber-Insulated Control Cable. High-quality product offering peak reliability, outstanding heat resistance. Cable is also highly resistant to moisture, acids, alkalies, other chemicals. Unusual overload capacity and long-aging characteristics. Individual conductor covering and over-all jacket of neoprene.

Anaconda Thermoplastic Control Cable Multiple-use. Can be installed aerially, in conduit, underground in ducts, or buried directly in earth. Available with polyethylene (600 or 1000 volts) or Densheath* vinyl resin (600 volts) insulation and Densheath over-all jacket. Densheath jackets over polyethylene-insulated conductors on request.

Butyl-Insulated Control Cable. Special ozone-resistant control cable. Individual conductor covering and over-all jacket of neoprene provide maximum insurance against moisture and mechanical injury.

Anaconda Type PND Control Cable. For general-purpose uses where space is a limiting factor. Allows installation of a 12-conductor cable in conduit carrying a 6 or 7. Individual conductor covering of abrasion-, oil- and gasoline-resistant nylon.

Permanent Full-Color Coding on rubber cables, by means of Anaconda's rubber-base coating, assures quick and positive circuit identification. Coding by surface printing, which conforms to IPCEA standards, also available. On thermoplastic cables, full-color coding with pigmented insulation and surface printed coding are likewise offered.

For full information on any of Anaconda's complete line of control cables – including cables engineered for more specialized control requirements – see the Man from Anaconda. A comprehensive technical booklet on Anaconda Control Cables is yours for the asking. Write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

*Reg. U.S. Pat. Off. 5829 Rev.

LIVE BETTER ELECTRICALLY

SEE THE MAN FROM **ANACONDA®**

FOR **CONTROL CABLE**

you can count on quality performance

The stamp of quality which identifies the plants Ebasco designs and builds can also be found in the many services Ebasco offers. One of these services is purchasing.

Ebasco, as agent for its clients, has purchased well over one billion dollars worth of equipment and material during the past half century. But Ebasco's purchasing service does not end with procurement. It also includes inspection at factory, expediting shipment, and traffic arrangements . . . all smoothly integrated with the customer's requirements to insure that the right equipment is delivered on time, in first class condition, at the lowest possible cost.

Acting as purchasing agent only, Ebasco provides a completely unbiased service from the selection of the first manufacturer to the auditing of the last freight bill. Our purchasing specialists can serve you well . . . around the world, around the clock.

For more information about these services write: Ebasco Services Incorporated, Dept. M, Two Rector Street, New York 6, N. Y.

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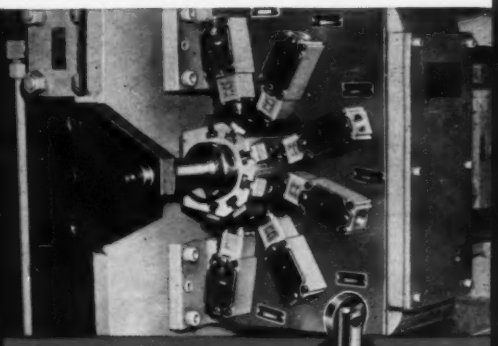
ALLEN-BRADLEY

BULLETIN 802T

OILTIGHT

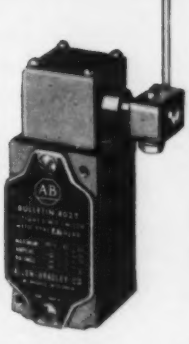
LIMIT SWITCHES



Radial mounting of six Allen-Bradley "manifold" type, push roller, oiltight limit switches.

SIDE PUSH ROD

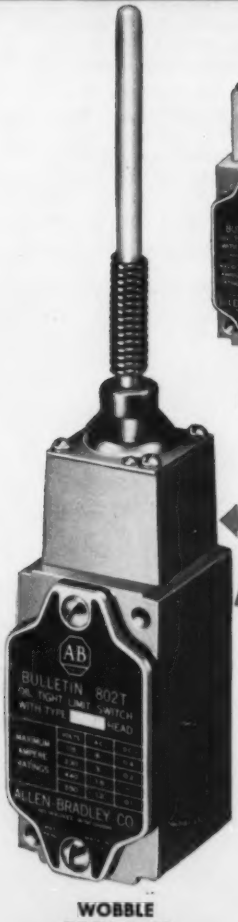
FORK LEVER TYPE



ADJUSTABLE ROD

TOP PUSH ROD WITH PLASTIC WINDOW

Push roller, oiltight limit switch, showing rubber grommeted wiring hole on back of "manifold" type, used on above automatic production machine made by Cross Company, Detroit.



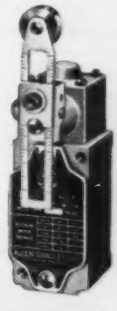
WOBBLE STICK TYPE

OIL SEALED HEAD AND BODY

assure reliable operation

Completely sealed . . . oil, dirt, and metal chips cannot foul up contacts or operating mechanism. Operating heads are interchangeable—can be mounted in any one of four positions. New "wobble stick" heads operate in any direction. All of these limit switches have maintenance free, double break, silver alloy contacts. Specify Allen-Bradley—the *quality* line of limit switches.

ROLLER LEVER FOR CAVITY MOUNTING



ADJUSTABLE ROLLER LEVER

A-B QUALITY

ALLEN-BRADLEY

MOTOR CONTROL

QUALITY

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

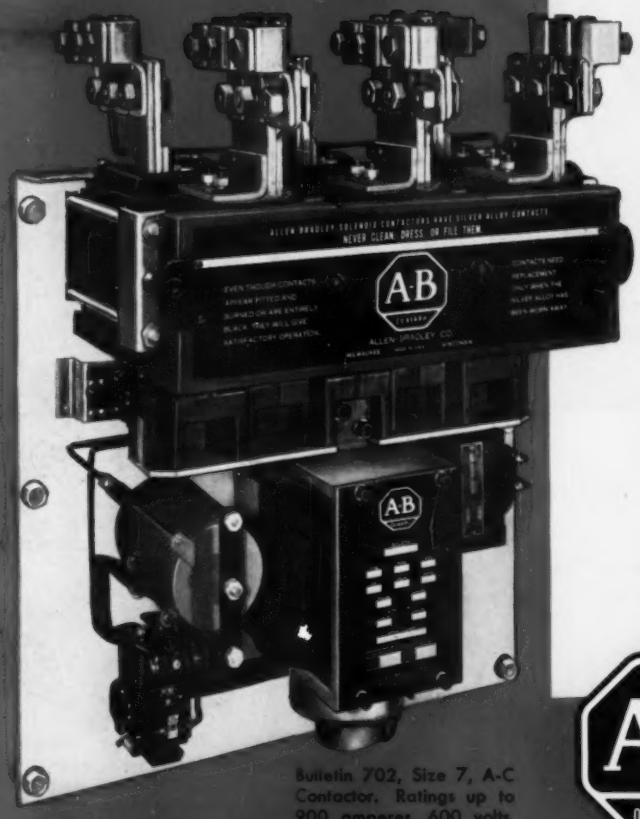
10-58-M

only

ALLEN-BRADLEY gives you Trouble Free Solenoid Starters in ALL SIZES!

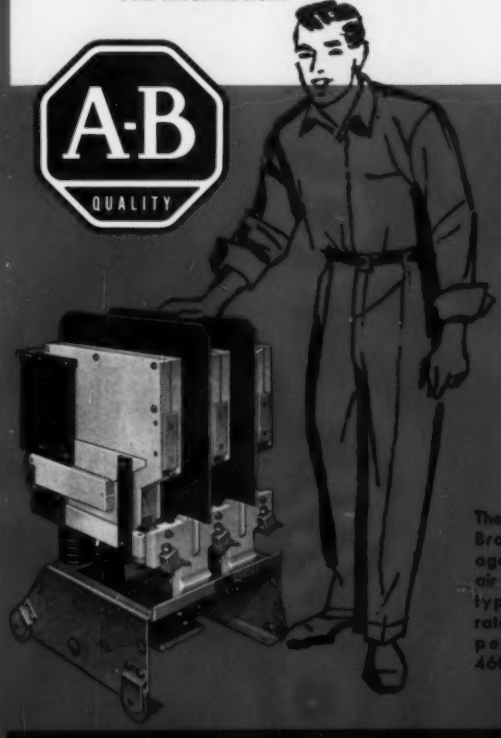
The simple solenoid design—exclusive with Allen-Bradley in the big starter sizes—has only one moving part. This eliminates the trouble causing bearings and flexible jumpers of conventional clapper switches . . . and assures millions of trouble free operations. A-B solenoid starters also have double break, silver alloy contacts that never need any servicing. They are always in perfect operating condition—until the contact is completely used up.

This time-tested solenoid construction is available on *all* Allen-Bradley starters up through Size 7 . . . as well as on A-B's rugged, air break, high voltage starters. Write for full information.

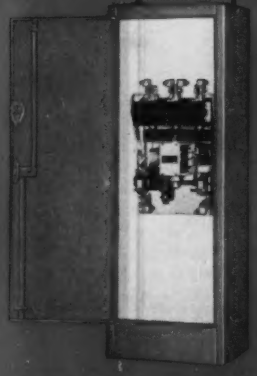


Bulletin 702, Size 7, A-C Contactor. Ratings up to 900 amperes, 600 volts. This basic solenoid contactor is used in large A-B low voltage starters.

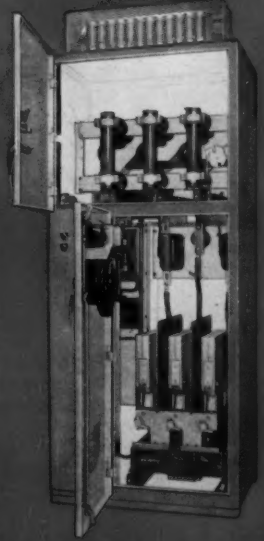
A-B QUALITY



The heart of Allen-Bradley high voltage starters is this air break, solenoid type contactor—rated at 400 amperes, 2300 or 4600 volts.



Bulletin 709 across-the-line solenoid starters are made in ratings to 300 hp, 220 v; 600 hp, 440-550 v.



A-B high voltage starters are built for all types of motors. Ratings to 1500 hp, 2300 v; 2500 hp, 4600 v.

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

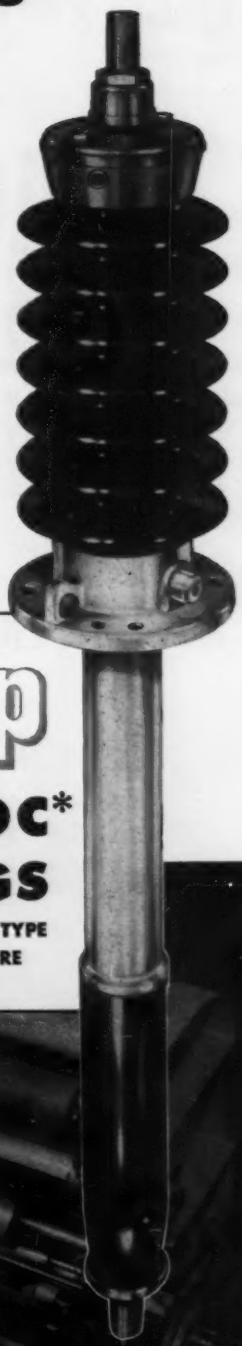
10-58-MB

LAYER-AFTER-LAYER

OF RELIABILITY GOES INTO

LAPP POC* BUSHINGS

FOR YOUR SYSTEM



Lapp POC* Bushings conform to ASA Standards. The small diameters specified by these standards permit design of new transformers and circuit-breakers of lighter weight, smaller size . . . and by use of inexpensive adapters, provide broad interchangeability for replacement in old equipment.

Lapp's solution to this reduced-diameter requirement is the POC* Bushing. In this design, a condenser series distributes voltage stress evenly and safely throughout the insulation. The condenser core is wound, as shown below, of multiple concentric layers of high-dielectric paper, interleafed with spaced aluminum foil layers. Paper is high-vacuum-impregnated and surrounded with oil, and the entire paper-oil core totally enclosed; the porcelain shank will not track or deteriorate under leakage current caused by contamination of equipment tank oil.

Paper-oil insulation ranks first in reliability as insulation for highest voltage cables, potheads and bushings. Lapp uses it in POC* Bushings at all voltages from 15kv up. Won't you sleep better with their extra safety margin protecting *your* system?

Lapp Insulator Co., Inc., LeRoy, N. Y.

Lapp

POC*

BUSHINGS

***PAPER-OIL CONDENSER TYPE**
TOTALLY-ENCLOSED CORE
ASA STANDARD

High Voltage Bushings on

WAGNER POLE-TYPE TRANSFORMERS

ASSURE FAST, SAFE CONNECTIONS, FEWER OUTAGES!

Hand-tightening terminals and insulating terminal guards are two of many good reasons why linemen prefer Wagner Form W transformers. They find them easy to hook up, with one turn of the big easy-to-grip hand knob, and outages caused by birds and animals are practically eliminated because the terminals of both sidewall and cover mounted high voltage bushings are fully insulated.

Other features of Wagner bushings include: Heavy wet-process porcelain for protection against accidental breakage . . . all terminals key-locked in the bushing porcelain . . . sidewall bushings key-locked in the tank wall . . . all terminals take either copper or aluminum conductor . . . weather-proof and leak-proof gasketed mountings . . . bushing clamps located inside tank to eliminate unnecessary projections and guard against rusting.

The Wagner pole-type transformers on which these bushings are used—single phase 167 kva and smaller, 15 KV and below—have all the other features you want—small size, light weight, high efficiency, low impedance values, good regulation and low losses. For detailed information call the nearest of our 32 Branch Offices or write for Bulletin TU-141.

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Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.

WT55-15

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

Neoprene-jacketed cables were removed from manhole after 9 years of service. Jackets were in excellent condition although sections of these cables had been submerged continuously.

In water for 9 years...lead-sheathed cable with neoprene jacket gives Philadelphia Electric Company "excellent performance"

Neoprene jacket offers cable lasting protection and often makes savings possible. A case in point: 975 feet of 69,000-volt cable installed in 1948 at Philadelphia Electric Company's Holmesburg substation.

The savings here were in laying the duct. Instead of the costly grading needed for drainage, the engineers specified three lengths of lead-sheathed cable jacketed with Du Pont neoprene to protect them against ground water in the duct.

This decision was fully justified recently when expansion of the substation required that the cables be removed. Inspection of the neoprene jackets showed no signs of deterioration — *even though sections of these cables had been totally immersed for nine years.* Also, sheath-to-ground resistances were 10 megohms per square foot at the time the cables were removed. This is excellent performance.

This is another example of neoprene's dependability. It is the preferred jacketing material for a great variety of wire and cable because of all resilient materials, only neoprene has balanced resistance to sunlight and weather, oils and chemicals, heat, flex cracking, abrasion and cutting, oxidation and aging.

It pays to be familiar with the properties of neoprene. We'll be glad to put you on the list for regular copies of the ELASTOMERS NOTEBOOK, detailing neoprene's performance in a wide range of industrial applications. Just mail the coupon below.

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Better things for better living
. . . *through chemistry*

NEOPRENE
— made by Du Pont
for 26 years

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No "ifs," "ands," or "buts" . . .

full 600-amp subtransmission load

with S&C's Alduti Load Interrupter

Here are two important reasons for full-load, full-voltage switching (as distinguished from loop sectionalizing where the voltage across the switch is low):

First—Emergency situations (wires down, etc.) demand quick action, hence dumping the load. There is no time to set up communications for complicated breaker and switch sequencing.

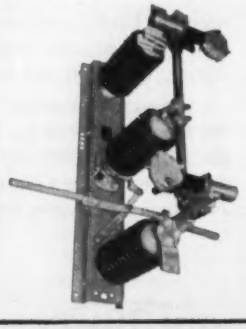
Second—There's always the possibility of an operator error or misunderstanding, with the result that a loaded circuit may be dumped inadvertently.

Under these circumstances, you will need *full* switching capability—with no limitation on the voltage across the device or on the load current.

The S & C Alduti Load Interrupter, with a record of 10 years of successful field operation, gives this kind of performance. It has had complete field tests under all circuit conditions, not simply line dropping or loop opening but at full load and at full voltage—600 amperes at 34.5 kv. Besides, this testing has been made extensive enough to provide published life ratings. And you get all this at the lowest price premium over bare disconnects.

Specify S & C Alduti Load Interrupters. For further information: S & C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S & C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.

The S & C Alduti Load Interrupter (Double-Break style). Illustrated here is the 600-ampere 34.5 kv rating. Note the *two* interrupting units in series.



If you are considering switches at 23 kv and 34.5 kv, check this list to be sure you are getting:

1. Full 600-amp load switching capability without line breaker or feeder breaker openings. ☐
2. Positive interruption of even very heavy current in parallel or loop circuits. ☐
3. Sure interruption of associated magnetizing and charging currents —cable charging included. ☐
4. A fully tested interrupting device, tested not only for full ratings but also for operational life. ☐
5. Maximum attainable safety to equipment or personnel if device is inadvertently opened. ☐
6. A device which uses a maintenance-free interrupting medium. ☐
7. A device with contacts which can be left for long periods of time without maintenance. ☐
8. A device that can be mounted in any position; vertical, upright, or inverted. ☐
9. A device which has a long period of field use and operational success behind it. ☐
10. A device which operates without external arc. ☐

Disconnects • Cutouts • LOADBUSTER® Load Interrupters • Metalclad Switchgear Fuse Links • Power Fuses

S&C LOAD INTERRUPTERS

Specialists in High-Voltage Circuit Interruption Since 1910

switching at full line voltage

...and at the lowest premium over disconnects

HOW TO LIGHT A BRIDGE AT LOW COST!

Five miles of lighting with aluminum standards brightens new bridge . . . lightens maintenance budget

By specifying lighting standards of corrosion-resistant aluminum, the Mississippi River Bridge Authority eliminated spiraling costs of painting and repainting once and for all. Although these aluminum lighting standards are exposed to the ravaging action of an industrial and seacoast environment, they'll stand up virtually unaffected for decades to come—attractive, durable, maintenance-free.

Comparable in cost to other types, lightweight lighting standards of Alcoa® Aluminum offer economies from the outset. They cost less to ship and handle; contractors erect them faster with less man power. Six different types of lighting standards installed at various locations on the bridge and its approaches indicate aluminum's wide range of design flexibility for standards, brackets and luminaries.

Alcoa does not make lighting standards, but we can supply you with the names of manufacturers who do. For these names and any additional information about lighting standards of Alcoa Aluminum, write to Aluminum Company of America, 1977-K Alcoa Building, Pittsburgh 19, Pennsylvania.

Your Guide to the Best in Aluminum Value

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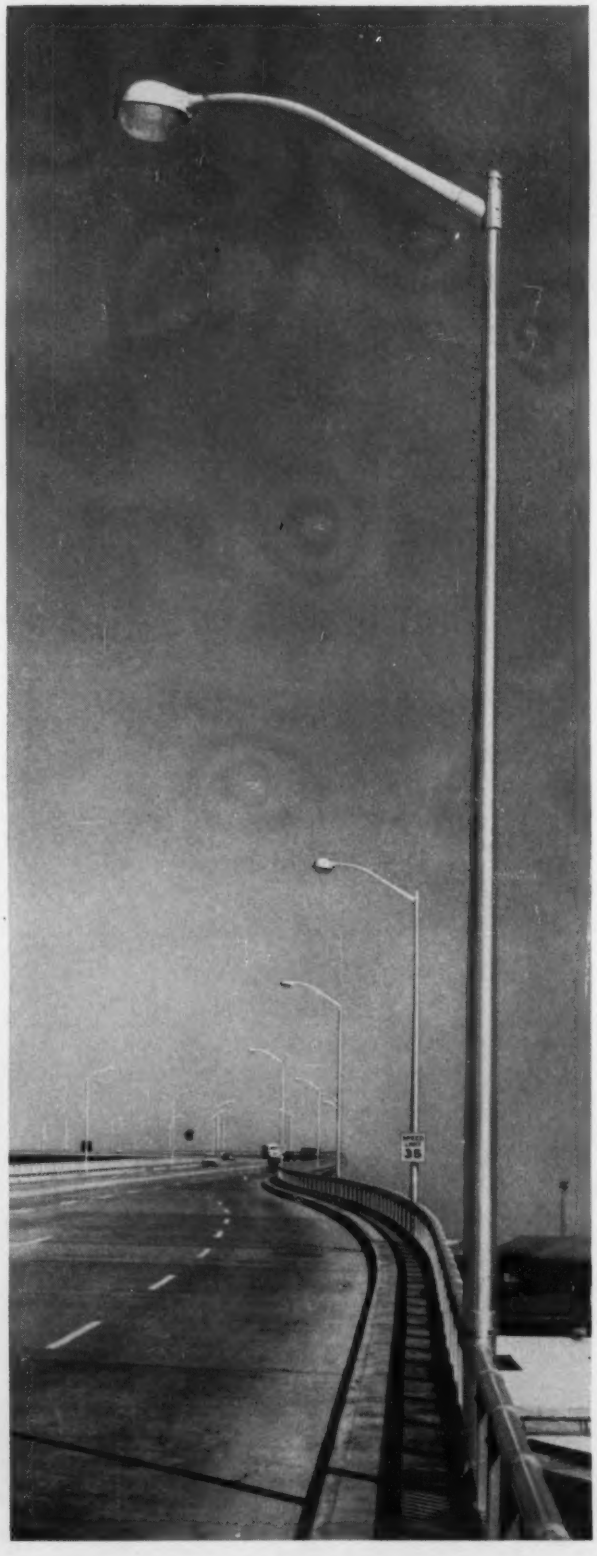
Fine Entertainment, Alternate Monday Evenings

WE CHOSE ALCOA ALUMINUM MILL PRODUCTS

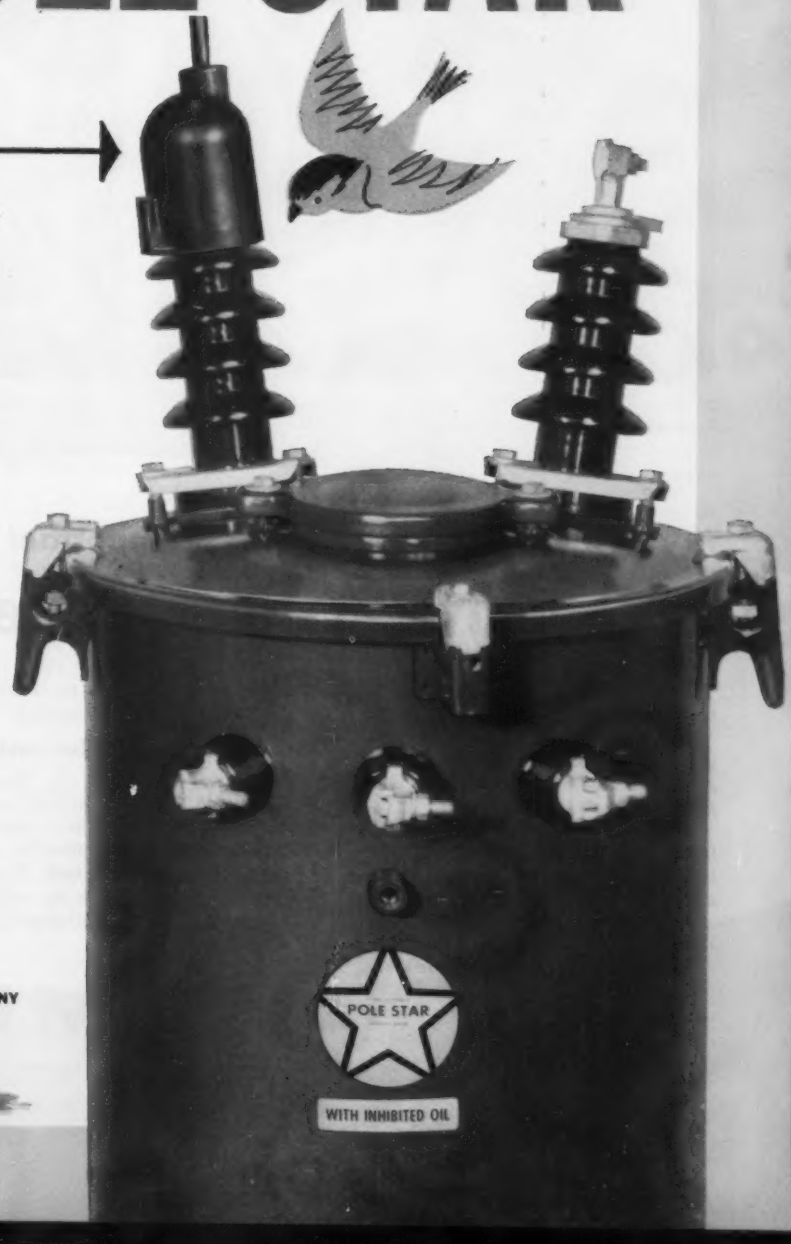


High above Old Man River is the world's longest cantilever highway span, the Greater New Orleans Bridge, an important link in Louisiana's expressway development plan. Consulting engineers: Modjeski and Masters, Harrisburg, Pa. Lighting standards: Pfaff and Kendall, Newark, N. J.

Wildlife a problem in your area?

POLE STAR®

offers an optional neoprene cap that slips easily over high voltage cover bushings. It protects your Pole Star transformer... and wildlife... without affecting the long-proved reliability of Pole Star's standard bushing

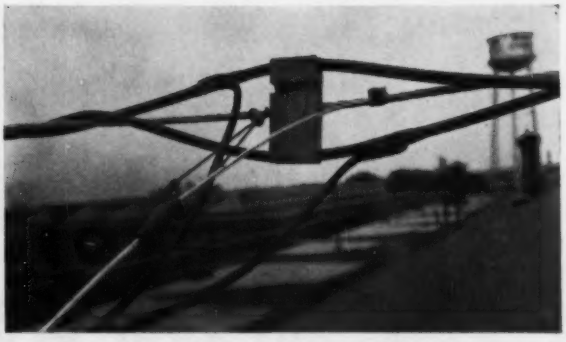


McGRAW EDISON

Pennsylvania Transformer Division McGRAW-EDISON COMPANY

CANONSBURG, PA. Greater Pittsburgh District

1. MID-SPAN TAPS help bring down the over-all cost of distribution with Rome's Triplex SD and secondary cable. You can tap between poles from either side, using conventional hardware plus a spreader block. Simple; fast; saves service wire. You save on pole cost, too—*as much as one-third*. With Rome's Triplex secondary you can span 300 feet from pole to pole. Use fewer poles; save time setting them; eliminate crossarms.



2. SAVE ON HARDWARE. Here's a comparison between the hardware needed to install one open-wire service drop (right)—using one pole—and Rome's aluminum Triplex equivalent (left) using a mid-span tap.

3. CUT MAN-HOURS on installation jobs. Triplex goes up much faster than open-wire service, because it requires less handling, less time installing hardware. It's easier to handle, too—aluminum cable assembly weighs less than conventional copper service wires.

If you take advantage of these important savings . . .

"Expensive" Triplex cables can cost less

Triplex sometimes *does* cost more than its open-wire equivalent.

But its on-line cost can be lower—*if you take advantage of the installation economies* that Triplex alone makes possible.

Fewer poles . . . less hardware . . . faster installation—these are the savings you make with Triplex. They can more than offset any extra cable cost.

In addition, there are many locations where you can improve service and reduce maintenance with Rome's aluminum Triplex. Wooded areas, for example—where Triplex *stays up* despite falling tree branches that might knock out open-wire secondaries. Residential streets, too—where good public relations indicates need for a neat, uncluttered installation.

Fits your modernization pattern

Introduced 10 years ago, Rome's Triplex SD Cable won almost immediate acceptance. As a next step in modernization, many utilities are now using lightweight aluminum Triplex for overhead secondaries as well. If you haven't yet adopted this practice, we invite you to look into the operating advantages—as well as the economies—that this Rome "package" concept offers you.

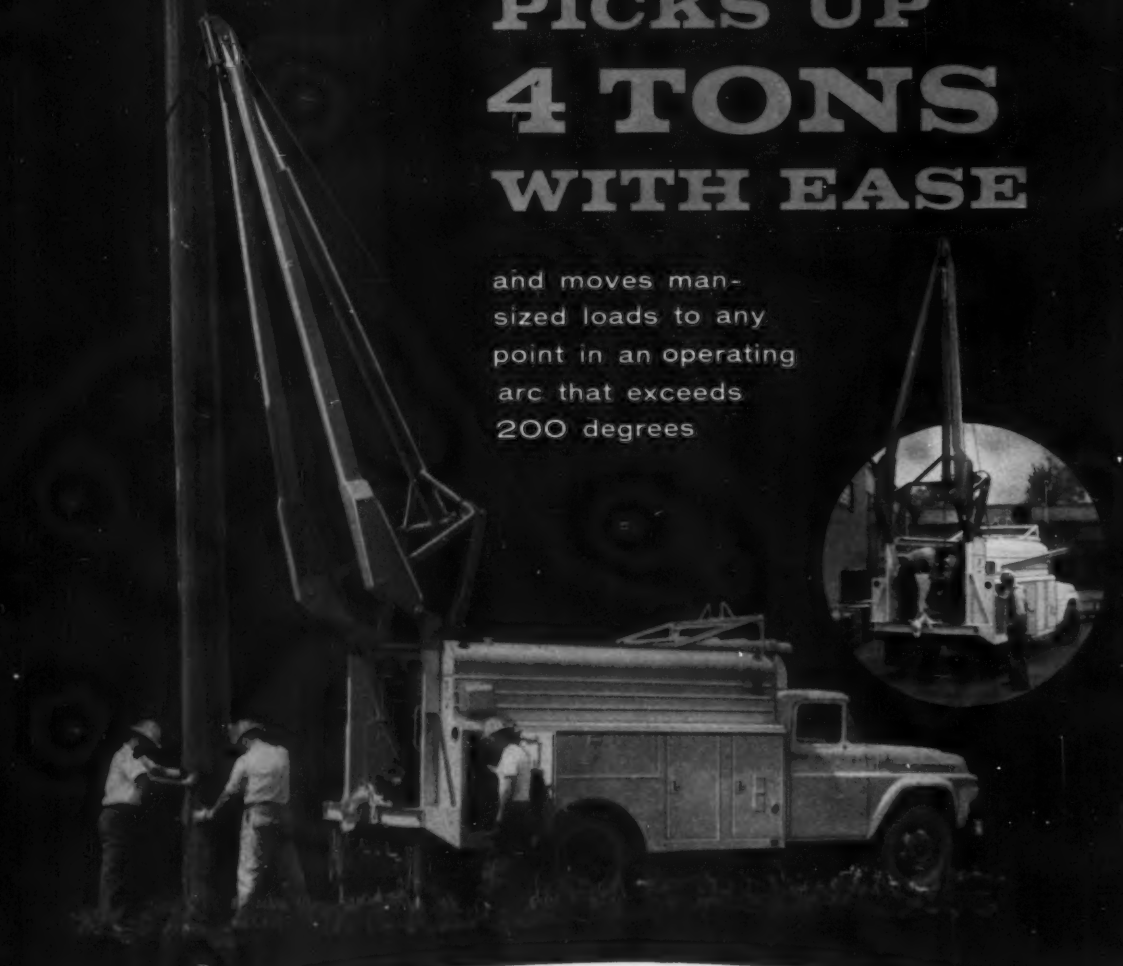
Specify Rome's aluminum Triplex for your next job. For more information, contact your nearest Rome Cable representative—or write to Department 368 and ask for descriptive Bulletin RCP-361. Rome Cable Corporation, Rome, New York.

ROME CABLE

CORPORATION

PICKS UP 4 TONS WITH EASE

and moves man-sized loads to any point in an operating arc that exceeds 200 degrees



Powers-American presents the **Series PM-1**

Pole-Master®

HYDRAULIC DERRICK

and the Series 550 Line Body

Get set for savings! This new Powers-American team brings out the best in a line crew... really beats down operating costs.

The powerful PM-1 "Pole-Master" gives you the kind of speed and capacity you want for pole setting work and other man-sized lifting jobs. It will move loads to any point in an operating arc that exceeds 200 degrees ...and the head sheave can be lowered to approximately 18" above the ground. Operation is controlled by a single lever. All the work is done by a single hydraulic cylinder and a single-drum winch.

The new Series 550 Body—available with or without crew compartment—carries all the tools and supplies needed for routine or emergency work. Keeps things in order, too... easy to find in a hurry.

Compare this new line team for design, quality and operating features. Then compare the down-to-earth price tag and you'll see why it's such a truly outstanding unit for your operation.

Take a minute right now to send for descriptive literature and price information!

Another reason why
UTILITIES EXPECT MORE FROM

POWERS American

UTILITY BODIES AND EQUIPMENT

McCABE-POWERS BODY COMPANY

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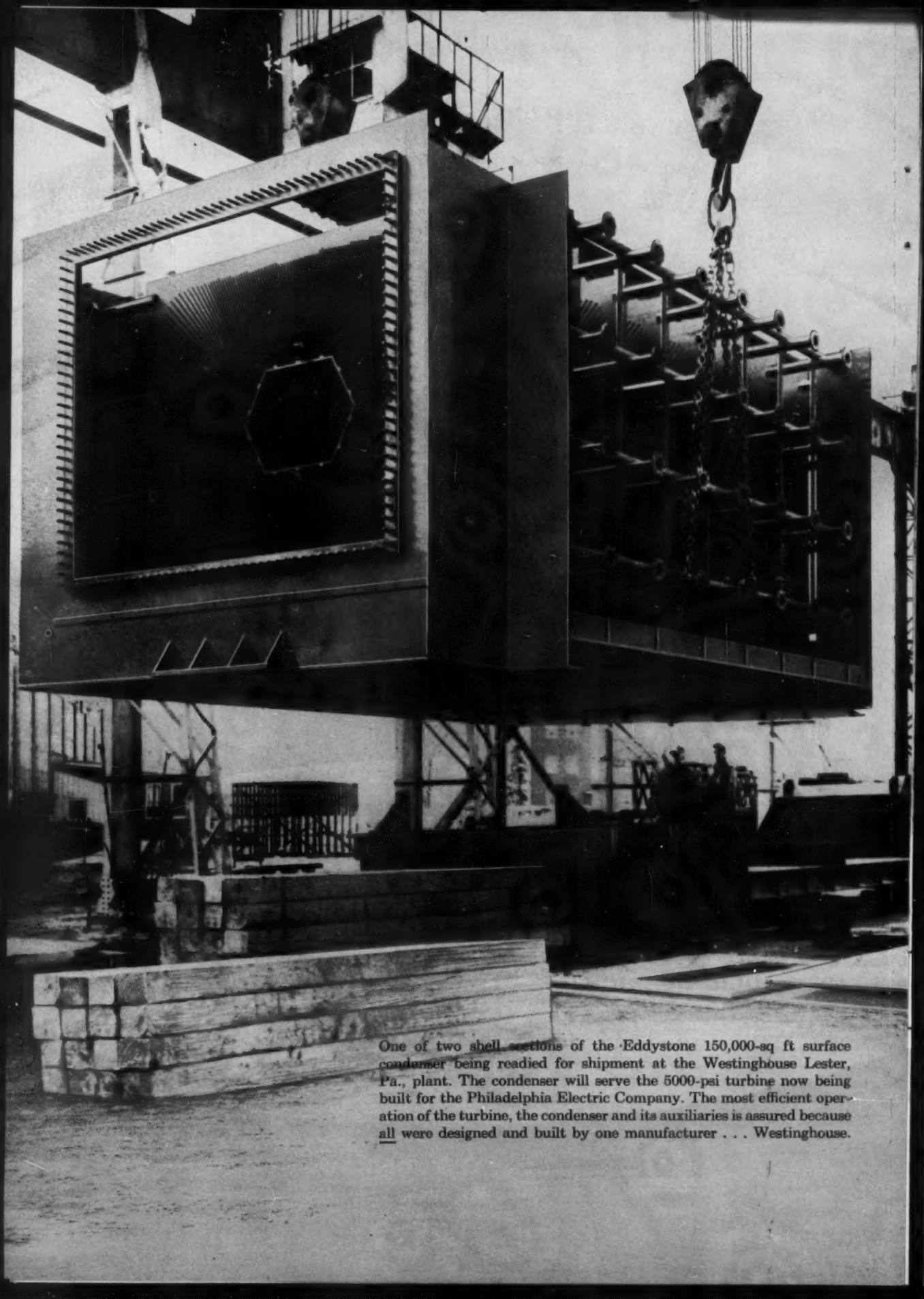


One of two shell sections of the Eddystone 150,000-sq ft surface condenser being readied for shipment at the Westinghouse Lester, Pa., plant. The condenser will serve the 5000-psi turbine now being built for the Philadelphia Electric Company. The most efficient operation of the turbine, the condenser and its auxiliaries is assured because all were designed and built by one manufacturer . . . Westinghouse.

New Westinghouse Condenser will help Eddystone 5000-PSI Turbine set world's efficiency record

ANOTHER GIANT STEP has been taken towards the completion of Philadelphia Electric Company's Eddystone station.

Westinghouse has shipped the 150,000-sq ft surface condenser to serve the world's most efficient turbine. Now being built by Westinghouse, the Eddystone turbine will use the highest temperature and pressure steam ever projected...5000 psi at 1200°F.

New Condenser

Because the Eddystone station will use a once-through steam generator, Westinghouse and Philadelphia Electric engineers jointly developed several new features for this surface condenser. *Both of these Westinghouse "firsts" were announced to the industry during the early design stages.*

The detection and location of even *small* leaks are made possible by twenty sampling compartments in the condenser's upper hotwell and collecting trays below the tube sheets. The lower hotwell is divided into three sections, and if any one becomes contaminated, the condensate can be by-passed into a water tank.

Through the second feature, during start-up or in the event of a trip-out or emergency, steam must be diverted from the turbine to the condenser. To protect the condenser from high-pressure and high-temperature steam, this steam is passed through four condenser injection coolers, which act as desuperheaters and pressure reducers.

Fifty Years of "Design Firsts"... Through Plowback of Earnings into Research

The installation of this Westinghouse condenser marks the 50th anniversary of Westinghouse research in designing and building surface condensers. During the past 50 years, Westinghouse has developed many of the *basic* condenser designs that today help the industry to produce low-cost electricity. Westinghouse "design firsts" include radial-flow, air ejectors, steel diaphragms for tube expansion, vertical propeller pumps and reverse flow valves.

Because of its vast and continuing research projects, Westinghouse has been traditionally *first* with design improvements. That's why it pays to specify Westinghouse. *You get today... the surface condenser of tomorrow.*

For complete information, contact your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-50608

Research developments now underway

Through Plowback of Earnings into research, Westinghouse is pioneering many condenser developments that will do much to help the industry meet future loads with low-cost electricity. Following are a few of the projects that are underway in the $6,000,000 Westinghouse Steam Development Laboratory

Lower costs for foundations

Westinghouse research and development engineers are exploring new structural designs that promise to slash the weight and size of surface condensers and result in lower costs for foundations.

Dropwise condensation for improved heat transfer

If tube surface were nonwettable, steam would condense as droplets, rather than as a heat-barrier film. Westinghouse is searching for the water repellent that will keep the tubes nonwettable *throughout the life of the condenser.* This research project will result in improved heat transfer rates . . . and permit a great reduction in the size, weight and cost of condensers.

Reduction of aerodynamic losses

Westinghouse engineers are probing all the interrelated causes of aerodynamic losses in the transition section between the turbine and the condenser. These studies, made in cooperation with the turbine department, are leading to design changes that will give the industry condensers that are not only smaller, but more efficient.

Greater velocity for increased efficiency

The greater the water velocity, the better the heat transfer rate. Also true — the greater the velocity, the shorter the life of the tubes. In the Westinghouse Steam Development Laboratory, engineers are busy studying ways to prolong the life of tubes subjected to water velocities greater than the present seven to eight feet per second.

YOU CAN BE SURE...IF IT'S **Westinghouse**

PREFORMED ARMOR RODS
increase uninterrupted service life of conductor

The wind blows, the conductor vibrates and the life of your line is at stake. If the vibration problem is such that severe frequency and amplitude conditions are sufficiently prolonged, the conductor could begin to break regardless of the protective armor used. And, if the conductor begins to break, PLP Preformed Armor Rods have a big advantage over other armor: The rods undertake the function of an electrical and mechanical repair splice.

All armor rods greatly reduce vibration stresses, but if vibration is severe enough to cause strand breaks, other types will not prevent parting of the strands. With PLP (short pitch) Preformed Armor Rods, it's a different story; the conductor is held tightly and uniformly throughout the entire length of the rods—not at one point. You have a long, firm grip that never relaxes, that maintains conductivity in spite of the break. Thus, your line continues to function unimpaired.

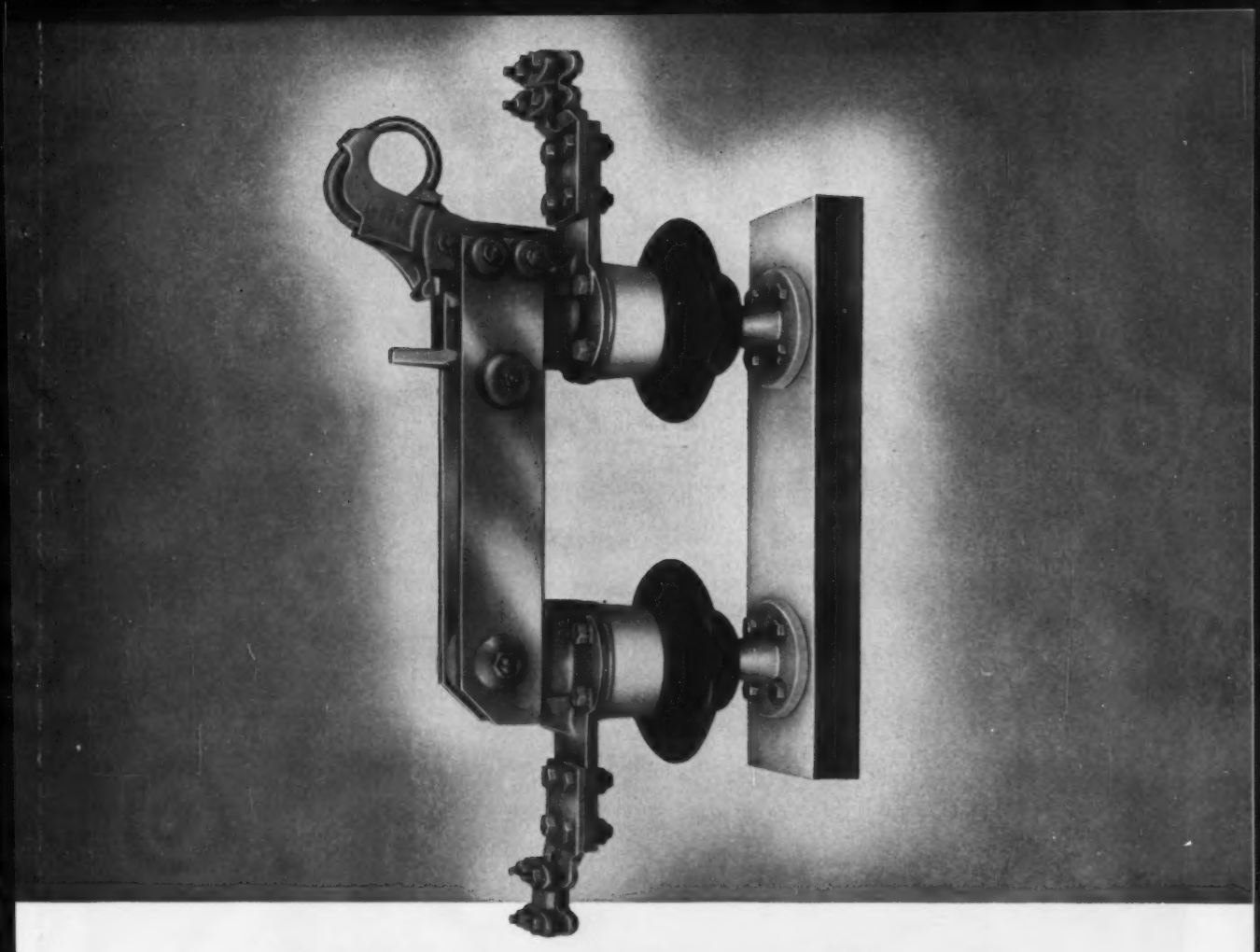
There is one other Preformed advantage to keep in mind. Some types of armor require the use of bolted end-clamps that can shake loose and cause chafing. Preformed Armor Rods require no end-clamps.

For a long uninterrupted service life, Preformed Armor Rods are the best suit of armor your conductor can wear. PREFORMED LINE PRODUCTS COMPANY, 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable Address: Preformed-Cleveland . . . in 10 years the leading manufacturer of armor rods, dead-ends, Guy-Grip dead-ends and other line accessories.

PLP

You can look up to **Preformed**

Made in accordance with or for use under U. S. Patent Nos. 2,609,653; 2,275,019 and 2,587,521. Other patents pending.



There is an Important Difference in this Southern States Disconnect

TYPE PBO-R

This regulator by-pass switch offers a compact unit that provides disconnecting means needed to by-pass and isolate voltage regulators. Available in ratings of 7.5 — 15 kv — 400, 600, and 1200 amps.

All hookstick-operated disconnects are simple devices. There are no intricate mechanisms — nothing complicated in their design or construction.

Certain highly desired features are fairly well standardized on disconnects being marketed today: positive latching of the blade in its closed position; a blade pryout; guides to position the blade when closing; and high pressure line contacts.

Yet there is an important difference in disconnects!

You can't see it feature by feature. It is apparent only when you take a good, studious look at the complete unit. For then you see how all of the features blend together to give you a sturdy, rugged and highly dependable piece of equipment.

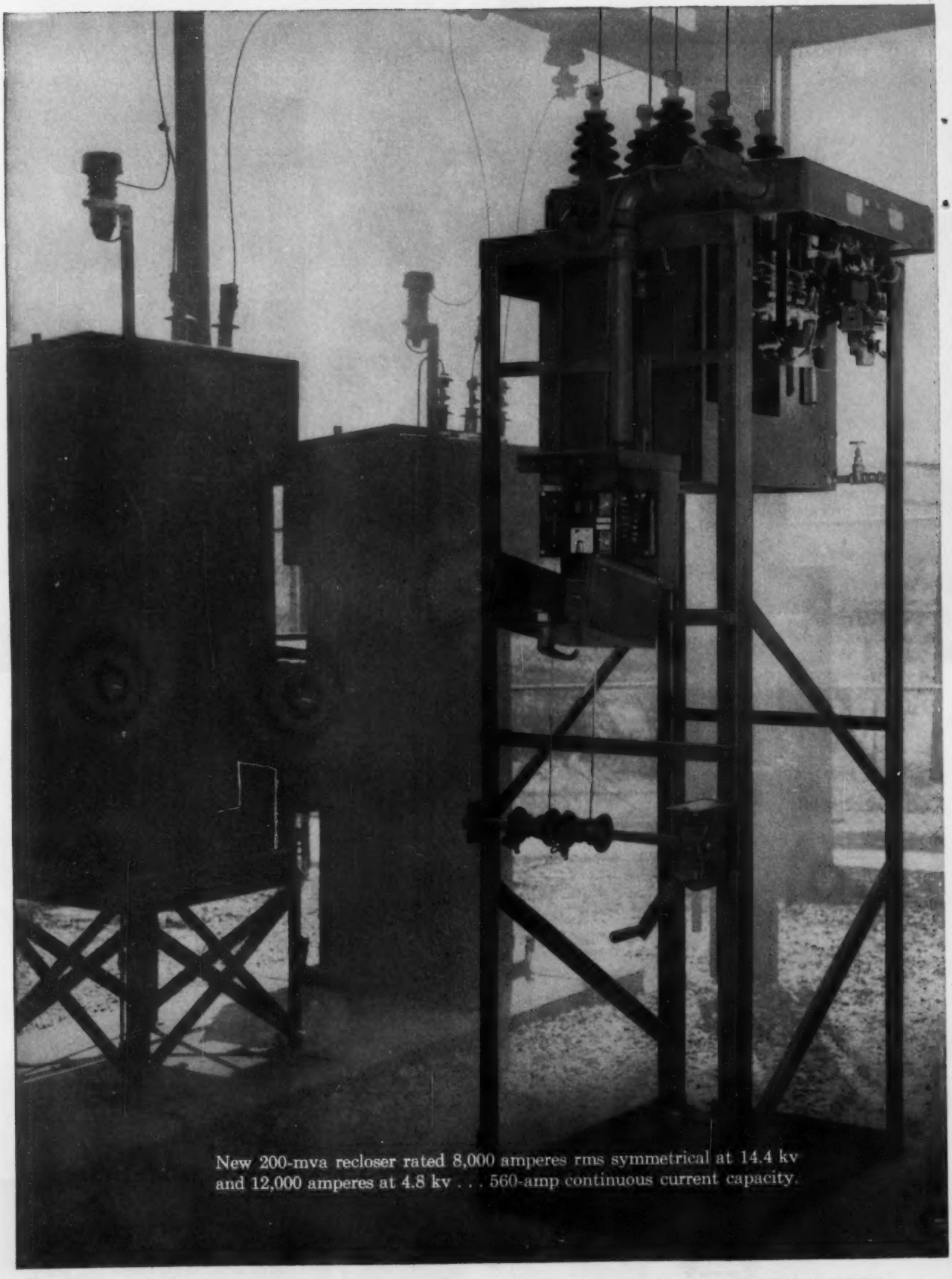
Take a look at the Southern States PBO Disconnect illustrated above and you'll see what we mean.

For the full story, see your Southern States representative, or write for Bulletin 55 PBO.

LIVE BETTER ELECTRICALLY

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto



New 200-mva recloser rated 8,000 amperes rms symmetrical at 14.4 kv and 12,000 amperes at 4.8 kv . . . 560-amp continuous current capacity.

Now... distribution circuit protection for 1/2 the cost of power circuit breakers!

Another product of Plowback of Earnings into Research

The new Westinghouse 200-mva three-phase power recloser brings you all the time-proven performance you've long associated with our line of oil circuit breakers, plus 2½- to 3-cycle interruption. Designed for economical distribution system protection, the new recloser is rated at 560 amperes continuous, and up to 12,000-amp maximum interrupting capacity.

Many of our oil circuit breaker assemblies have been incorporated in the new Westinghouse recloser. These rugged components, combined by design engineers who've pioneered circuit interruption techniques, provide the outstanding buy in distribution circuit protection available today.

In addition to the breaker bushings, grids and operating mechanism described below, the new 560 PR recloser utilizes proven air dashpots from the DB industrial breaker . . . providing flexible and reliable relaying characteristics which are unaffected by temperature. 600/5 breaker-type bushing CT's are used. Standard, adjustable SC ground relays give ground tripping sensitivity of 30 amperes.

Conservative design permits overload capacity under emergency conditions without damage to equipment. Combined with 2½- to 3-cycle interruption, this means maximum utilization of your system capacity . . . with minimum danger of conductor burndown or damage.

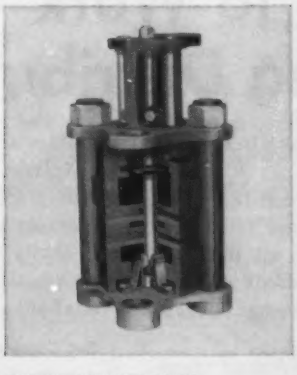
For complete information about the 560 PR recloser, call your Westinghouse sales engineer. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. Ask for Descriptive Bulletin 38-725.

J-60954

YOU CAN BE SURE...IF IT'S Westinghouse

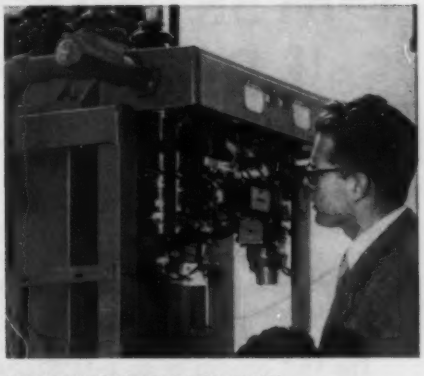
CONDENSER BUSHINGS

Standard Micarta® breaker condenser bushings are used for ruggedness to resist the high shocks of severe fault interruptions.



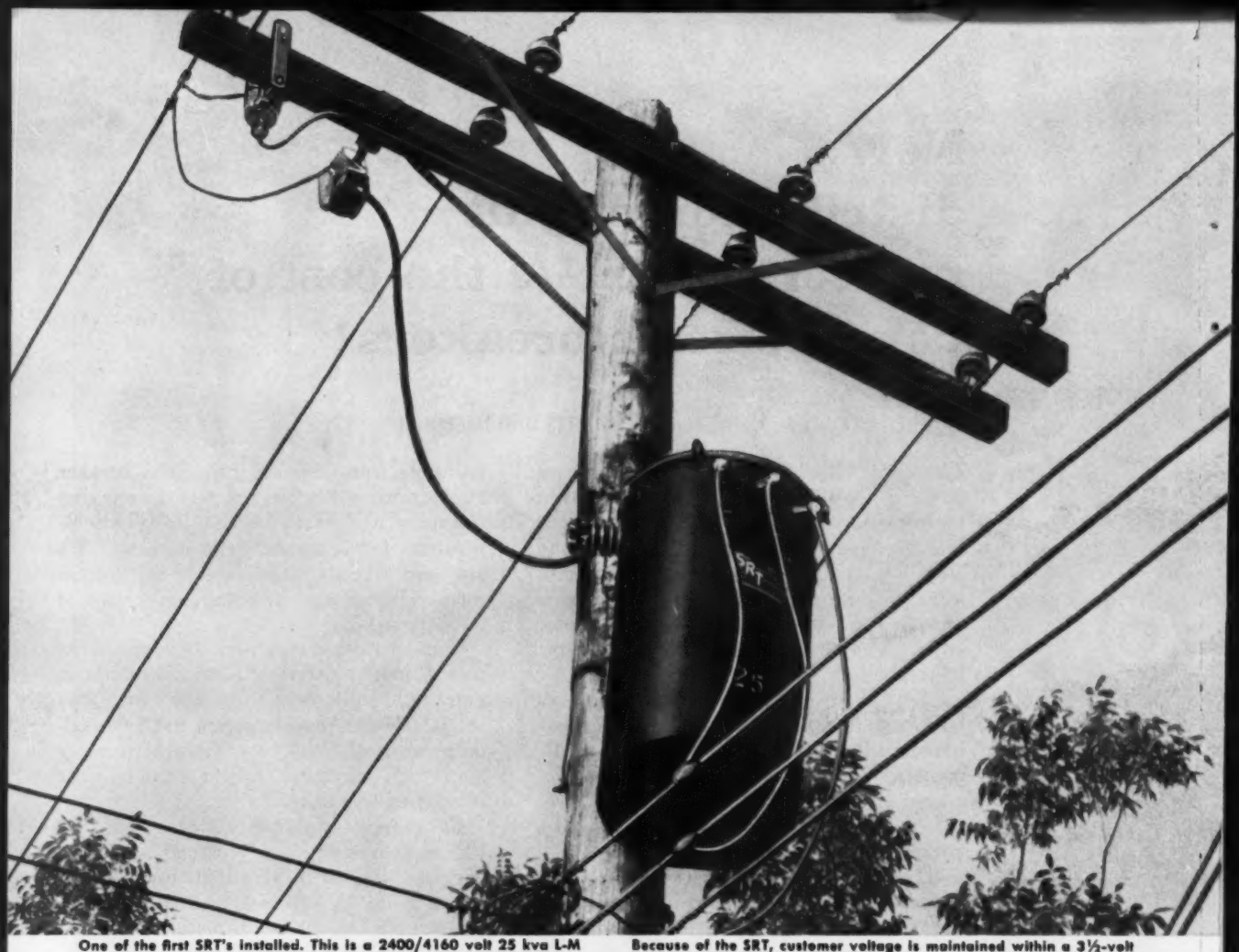
CIRCUIT BREAKER GRIDS

Unique high pressure current transfer roller of De-ion® grids provides high-speed 2½-cycle opening to prevent conductor damage and burndown.



NETWORK PROTECTOR MECHANISM

240-volt motor closing mechanism. This low-voltage control permits easy checking of your calibration curves and simplified maintenance. Mechanism provides 30-cycle high-speed reclosing.



One of the first SRT's installed. This is a 2400/4160 volt 25 kva L-M Self-Regulating Distribution Transformer serving six homes, several of which are equipped with electric ranges, air conditioners, dryers, and other heavy consumption appliances.

Because of the SRT, customer voltage is maintained within a 3½-volt band width, providing better service to the customers by avoiding voltage drops that would reduce the efficiency of lights and appliances in these homes.

L-M SRT's Go To Work—Industry's First Self-Regulating Distribution Transformers

This SRT, like many others, is going to work to regulate voltage within a 3½-volt band width.

The SRT, announced last June, has been the year's biggest sensation in distribution apparatus. Utility executives, engineers, and operating men all over the country have asked for information. Hundreds of orders for units have been received, and are being filled as quickly as production capacity permits.

The SRT consists of an L-M Round-Wound transformer, with primary taps connected to an under-load tap changer. A control device sensitive to secondary voltage actuates the tap changer.

Voltage is centered around 120 volts, or 123 if desired, within a 3½-volt band width. An inherent time delay prevents tap changes on momentary drops.

L-M's Adapt-A-Tap feature permits a 10% range of automatic regulation to be applied above, below, or straddling the normal voltage.

Get Complete Information

Ask the L-M Field Engineer for complete information and literature on the SRT—L-M's revolutionary new development; or write Line Material Industries, Milwaukee 1, Wisconsin.

351

LM

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

McGRAW EDISON

Distribution Transformers

OCTOBER 27, 1958

Implications of Proposed Atomic Power Policy

An expanded civilian nuclear power program has recently been proposed in a staff memorandum issued by the Joint Committee on Atomic Energy of the U. S. Congress (EW Sept 1, p 45). It would be well for all who have an interest in the future of the utility industry to examine this document in detail, for its propositions may not only put the federal government deeper in the power business but might also delay or at least confuse the objective of the program, "to demonstrate economically competitive nuclear power in the United States by 1970". The memorandum states that, "The ultimate goal of the entire program is to develop strictly commercial plants which would be economically competitive *without financial assistance from the Government.*"

In order to attain the objective the staff memorandum recommends: **1.** Increased research and development, and **2.** "Programmed" design, construction, and improvement of diversified nuclear power plants. For the second objective the memorandum suggests reactor projects and approximate dates for the projects.

To accomplish the objectives the AEC would continue to direct and finance the major portion of reactor research and development as it has in the past. And the design and construction phase would be carried out through an expanded and modified power reactor demonstration program of privately owned "second generation" plants and through government ownership of advanced experimental prototype plants and of "other desirable plants not otherwise proceeding."

The language of this proposed program is vague enough to permit a socialistic minded government agency to severely limit private industry participation in the program. For, what is a "second generation" plant? Would the Yankee Atomic Electric Co's pressurized water reactor be considered a "second generation" plant? Or is it a new one because of new fuel element design and thus in the scope of federal ownership?

And how can we really develop "strictly commercial plants which would be economically competitive without financial assistance from the government" if some of the plants are to be federally owned? We have spent years trying to unravel the true costs of federally owned hydro and steam plants. Can we expect that added complexities of nuclear research and development charges will simplify the problem of ascertaining the true cost of federally produced power?

And even before answering this we must be more specific about our objectives. Cost of electric power in New England is considerably different from that in Texas or the Ohio Valley. We must answer the question, "Economically competitive *where*?"

And lastly should a politically oriented body like the JCAE outline the details of such a program? Granting that they are technically advised by competent men, wouldn't it be far more fruitful to let the proven competitive incentive of private industry direct the details of a program once the objectives are agreed upon?

Some technical and policy leadership is of course needed. But shouldn't the administrative and technical details be the responsibility of industry?

We believe the utility industry should consider these questions in evaluating the merits of this proposed program. And lest we seem too critical of it, we note with approval the program's objective to, "develop information and not power per se." This is a far cry from the Gore bill considered so necessary about two years ago by this same group.

Campbell Reconsiders His REA Ruling

Comptroller General takes another look at his controversial ruling on REA loans to serve new customers. He backs down on some points, holds his ground on 'availability' issue

Comptroller General Joseph Campbell—after two months of reconsideration—has backed down on several controversial points in his attempt to limit the Rural Electrification Administration in making loans to co-ops for serving new customers.

However, Washington observers generally agree that Campbell has stuck by his guns on one criticism of REA practices—what Campbell calls REA's illegal practice of making loans to co-ops for furnishing power to unserved persons "without regard to the availability of service from other areas."

A Letter to Benson

His new opinion, replacing an earlier one issued July 21, is summed up in a 25-page letter to Agriculture Secretary Ezra Taft Benson. Campbell agreed to reconsider the earlier ruling after receiving strong protests both from Agriculture and from the National Rural Electric Cooperative Association (EW, Aug. 11, p 35 and Aug. 18, p 60).

In his earlier opinion, Campbell called on Benson to recover $120,000 immediately from Central Iowa Power Cooperative—the portion of an REA loan used to finance a 20-mi power line to Lehigh Sewer Pipe & Tile Co—because Lehigh was only 160 ft from an existing power line of Iowa-Illinois Gas & Electric Co, and the company was willing and able to supply Lehigh.

Campbell also had pointed out that REA could not lend money to co-ops to build power lines in any area "already served by private power companies when such companies are willing to provide adequate central-station service to persons within the area." This area limitation was interpreted by NRECA and Agriculture as a potential death-knell for the REA program, as private power companies already are serving in nearly every area of the U.S.

Campbell has backed down from his previous ruling on several important points:

- The Iowa co-op won't have to pay back the $120,000 loan immediately because the entire amount already has been spent, the 20-mi line to Lehigh is now in use (and 307 farm customers are also connected to it) and the loan must be repaid at 2% interest to REA anyway.

CAMPBELL: Another look at REA

- Campbell says there was an "apparent misunderstanding" as to what he meant by "areas" where REA loans should be prohibited. He now defines an "area," where co-ops should not use REA funds to connect unserved customers, as directly along an existing private company's power line, when the company is willing and able to serve the unconnected rural customers involved. In the case of Central Iowa Co-op, Campbell pointed out that 160 ft is close enough to an existing power source to prohibit use of REA loans to connect the customer with a co-op.

The key word in Campbell's new definition is "extension." As he points out, the General Accounting Office feels that REA loans are permissible "to serve unserved persons who might be supplied by existing central stations, if such stations extended their lines . . ."

- Campbell stated that GAO does not have authority to review loans made by the REA administrator "with a view to taking exception thereto or disallowing" such loans. Such administrative decisions must be respected, he said. However, Campbell pointed out, "if a determination (by REA) which may be legally unsupportable under the strict letter of a statute is considered by us to be contrary to the evident spirit and intent of Congress . . . we feel we have a duty . . . to report the matter to the Congress . . ."
- He also noted an "apparent Congressional aquiescence" to REA's policy of making loans to unserved rural customers without regard to the availability of service from other sources. Agriculture had argued that there was tacit Congressional approval of such a policy, and that any change in the interpretation of the REA act now would break an accepted "uniform administrative practice" of the past 22 years.

Campbell stuck by his guns, however, on one important issue of the new opinion: Did Lehigh qualify as a "new customer" under the REA act, thereby making the Iowa co-op eligible for an REA loan to build a power line to it?

Hits Lehigh Line

Campbell insists that the Iowa co-op could not legally use the $120,000 REA loan to build a line to the tile plant because the plant was only 160 ft from an available power source, Iowa-Illinois, which was willing and able to serve. He also noted that the power company's proposed rate to Lehigh was reasonable, even though it was higher than the rate proposed by CIPCO. He questioned Agriculture Dept charges that the new tile plant was separate from an older plant operated by Lehigh and served by the power company on grounds that: **(1)** both plants are on the same plot of ground, **(2)** numerous facilities of the two plants are operated jointly,

(3) at the present time both the old and new Lehigh plants are receiving power from one meter (CIPCO has taken over service to the older plant since the loan was granted).

The whole issue will be sent to Congress, said Campbell. He emphasized that GAO has "considerable doubt that the legislative history of the Rural Electrification Act, taken as a whole, contemplated the making of a loan to furnish electric energy to an unserved person located on an existing power line, where the property to be served is alongside of power lines and the owners of the power lines are ready, willing and able to furnish adequate central station service to such unserved persons at a reasonable price." He added that he plans to seek a Congressional review of both the general meaning of the REA act and the specific alleged violation involving CIPCO.

No Enforcing Power

The Comptroller General has no statutory power to enforce his rulings, and has relied in the past on the growing authority of his decisions to persuade various department heads to accept them. In the event the department in question does not choose to accept his ruling, he can only report to Congress.

Campbell, however, is not the only one planning to take this issue to Congress. General Manager Clyde Ellis of NRECA charged that Campbell's new opinion is "essentially a dishonest reaffirmation of a dishonest decision," and promptly mailed letters to 60 members of Congress, calling for a review of what Ellis calls, "improper influence" in Campbell's office by private power companies. "There are definite signs of power company involvement at the General Accounting Office, and we think it would be proper for Congress to examine this infiltration," he added.

NRECA does not plan to file another protest with GAO. "We feel it is useless to any longer expect judicious, objective review from Campbell. We feel it is time for Congress to examine Campbell's sorry record," Ellis added.

Agriculture has not decided whether it will file another protest with GAO, but probably it will take no action until the matter is taken up next year by Congress.

GE, Westinghouse vs the IUE

Two top companies offer plans for 'individual' employee security. IUE's Carey objects

CAREY: Calls up the 'artillery'

Chances looked good for a peaceful and non-inflationary labor settlement in the electrical manufacturing industry as negotiations between the leading union and the two leading companies reached a lull last week.

Negotiations between the unions —headed by James B. Carey's International Union of Electrical, Radio, and Machine Workers—and General Electric Co and Westinghouse Electric Corp have been taking place under employee-security reopener provisions in five-year contracts expiring in 1960. They effect about 100,000 IUE workers in the two companies.

Before any talks began, GE and Westinghouse each stated plainly that the union could expect nothing more costly than the increases already in the original contract.

Nub of the negotiations between GE and the unions is a savings and security plan proposed by the company. Early this month, Westinghouse offered a similar proposal.

No Appreciable Extra Cost

Objective of both plans is to provide greater employee security benefits at no appreciable extra cost to the company. Both plans would set up investment accounts for employees to which the company would contribute.

GE's 1955 contract called for employees to get a 3.48% increase on Sept. 15, 1958, and another 3.46% on Sept. 15, 1959. Employees' pension contributions would drop by 1% on Oct. 1, 1958.

Under GE's savings and security plan, employees would get instead a 2½% increase and the 1% decrease in pension contributions on Jan. 1, 1959, and another 2½% increase Jan. 1, 1960.

Employees could invest up to 6% of their earnings in a personal account, and the company would then deposit $1 for every $2 invested. Employees who elected not to invest in the plan, could receive the benefits specified in the original contract. In either case, cost-of-living benefits would continue as per the 1955 agreement.

According to GE, costs of the new plan would remain about the same as under the original contract.

The IUE proposed an eight-point program emphasizing supplementary unemployment benefits, but its position was weakened when several large locals turned down Carey's bid for a strike vote.

GE sought to show that its plan would in effect provide SUB, but would keep the money under the control of the individual employee. A $5,000-a-year worker could accumulate approximately $1,500 in three years—enough, the company notes, to add $40 a week to state unemployment benefits for a period of 37 weeks.

More Than SUB

The company has stressed that the plan allows the employee to use the money for emergencies other than unemployment, and for better living or retirement if no emergencies materialize.

The Westinghouse employee security program is also marked by an individual rather than a collective approach. It embodies the same general principles as the GE plan, but has different features. These include:

- A plan to open individual employee security "bank accounts,"

with the company depositing each month an amount equal to 2½% of the employee's earnings.

- A separate voluntary plan, under which employees can save up to 4% of their pay. The company will add a 15% bonus on money remaining in this account for three years.
- Two 3½% increases scheduled for October 1958 and October 1959 would be cut to 2½% to help finance the plan.
- Also included in the Westinghouse program are an improved pension plan, a loan program for certain financial emergencies, and separation pay for longer-service employees in the event a plant or office is closed permanently.

Carey's IUE quickly rejected the Westinghouse offer, as it had earlier rejected GE's.

GE Negotiations Stormy

Westinghouse negotiations have been proceeding quietly until recessed last week, while those at General Electric have been marked by charges and counter-charges between IUE Pres Carey and GE's top negotiator, Virgil B. Day. Most recent episode, however, had the ring of a long-range artillery duel rather than a close-in skirmish, as AFL-CIO Pres George Meany blasted GE and Westinghouse as "ungenerous," and GE's Day countered by reiterating the advantages of his company's plan.

Negotiations at Westinghouse are due to be reopened Oct. 29. As Electrical World went to press, no further meetings between GE and the IUE had been scheduled.

Meanwhile, IUE employees of both companies are receiving the increases called for under the original five-year contract.

Rates and Regulation

- **PSC approves promotional rate for Alabama Power**
- **Washington System to ask Packwood Lake license**

A revised urban residential rate for Alabama Power Co has been approved by the Public Service Commission. The change will give a 0.2¢-per-kwhr discount to high-usage urban residential users having relatively high annual load factors.

The revised schedule only affects the last step of the former rate. Under that schedule, the minimum average rate of 1.4¢ per kwhr is reached at 1,363 kwhr monthly, and the 1.4¢ applies to all additional energy. For customers qualifying for the new schedule, the 1.4¢ rate will be reduced by 0.2¢ for energy in excess of base use. Base use is the greater of either 1,363 kwhr per month or 40% of the highest kwhr in any month during the preceding 12 months.

Eligible customers must have:

1. Total usage during three highest summer months of not more than 110% of the total usage during the three highest winter months.

2. And usage in excess of 1,363 kwhr during each of the three highest winter (November through April) months.

Base use is the greater of either 1,363 kwhr per month or 40% of the highest kwhr in any month during the preceding 12 months. All monthly usage above the base figure during the 12-month period which ends each April will be reduced by 0.2¢ per kwhr; and refunds will be computed every May, starting in 1959. Thus, the revised rate is retroactive to last May.

- The Washington Public Power Supply System expects to request a construction license for its first project soon after the first of the year, Manager Owen Hurd said after a meeting of the system's board Oct. 17.

The project is the $5-million Packwood Lake development, originally proposed by Lewis County PUD. It would have installed capacity of 30 Mw, but firm power probably would not exceed 10 Mw. Packwood Lake is one of a number of small projects under study by the group, Hurd said, but the first for which the FPC has granted a preliminary permit.

The system hopes the AEC will allocate $500,000 for studies on the largest project—Ben Franklin Dam on the Columbia River.

BRIEFS . . . Circuit Court Judge Sam C. Blair has affirmed a Missouri PSC order granting a $678,000 a year rate increase for Missouri Power & Light Co. Court also approved an order granting higher rates to Empire District Electric Co . . . Ford, Bacon & Davis has been hired to study rates of Tacoma City Light.

Big 'Electrical Week' Planned for '59

More than 250 communities are expected to form committees to guide local observances of National Electrical Week, according to N. J. MacDonald, president of Thomas & Betts Co, and head of the NEW committee.

Already 50 national advertisers have indicated their intention of taking part in the Feb. 8-14 promotion with network TV, radio and national magazine messages, MacDonald said.

Theme of the third observance is "Electricity Builds Jobs."

Science Youth Day programs, under the auspices of the Thomas Alva Edison Foundation and International Edison Birthday Celebration Committee, again will receive cooperation from the NEW group, he said.

Kits and guides have been sent to 4,500 industry leaders. Extra copies are available at $1 each from NEW, 290 Madison Ave., New York 17.

Merrill E. Skinner, vice president of Union Electric Co and national chairman of NEW from 1955 through the 1958 observance, was presented a special resolution of appreciation by MacDonald.

U.S. Power Picture

- **Big Bend Dam development runs into a new snag**
- **$83-million Merced project called 'feasible'**

Big Bend Dam in South Dakota, whose progress to date would justify a nickname of Big Headache, is heading towards a new difficulty.

At issue is Farm Island, a 900-acre tract in the Missouri River 7 mi downstream from Pierre. Developed as a state park, Farm Island houses the Pierre Country Club and the Izaak Walton League. Last year—an off year, incidentally—it was visited by 130,000 persons.

Sen. Karl Mundt (R-S.D.), a stalwart supporter of Army Engineers at appropriations time, has called on the engineers to work out a Big Bend plan "that would not destroy Farm Island."

But Army Engineers last week revealed that they are proceeding with plans that would do just that. The engineers said that planning is proceeding on the basis of a normal pool elevation of 1,422 ft above sea level, 6 ft above the level previously contemplated.

This would shove water all the way to Oahe Dam—located 4 mi above Pierre—put Farm Island under water, and permit maximum output of 240 Mw from Big Bend's four 60-Mw generators.

$12 Million to Save Island

To keep Farm Island dry, Army Engineers indicated, would be to forego head that would result in a loss of $12 million in power revenues over the economic life of the dam.

South Dakota representatives met with Army Engineers Oct. 20 to discuss relocation of facilities on the island.

Harry Woodward, director of the South Dakota Game, Fish and Parks Commission, said the Army Engineers' announcement of the 1,422 ft pool level "caught us in the cold and we haven't had a chance to analyze what we will do."

He estimated the replacement cost would be $1 million.

The new issue came to a head as an earlier one was cooled down by congressional action.

It was accomplished by legislation pushed by Sen. Francis Case (R-S.D.). Its objective was the fact that virtually none of the benefits of Big Bend—almost exclusively a power dam—would go to South Dakota. The dam's power would be drained off by Nebraska, an all public power state, under the preference clause.

The Case legislation provides that a "reasonable" amount of Big Bend's output will be reserved for South Dakota users. The Secretary of the Interior is given authority to fix the amount but the total cannot exceed 50% of output.

The Case proposal was tied to a measure appropriating $600,000 to finish planning and begin construction of the dam, last of the Army Engineers' Missouri River dams to be built. Construction is to start in the spring of next year.

The dam, although relatively small by Missouri River standards, will be among the world's major earthen dams. It will be 6,460 ft long, 100 ft high and have 2 million acre-ft of storage. Its cost is estimated at around $85 million.

• An $83-million water and power project contemplated by the Merced (Calif.) Irrigation District has been termed "economically and physically feasible" by a San Francisco engineering firm, and the district now plans to seek necessary permits from regulatory bodies.

Target date for beginning construction is 1960.

The district is now negotiating with Pacific Gas & Electric Co to arrange a power purchase deal patterned after the one that enabled Oakdale and South San Joaquin Irrigation Districts to finance their $52-million Tri Dam Project.

New Mast Towers Above the Hudson

This view from the bank of the Hudson River shows the central mast being used to construct the steel sphere for Consolidated Edison Co of New York, Inc, Indian Point nuclear plant. The 160-ft dia steel enclosure will be shielded by a reinforced concrete jacket. Con Ed expects to have the 236-Mw pressurized-water plant in operation in 1960. In the right foreground work is under way on a utility tunnel which will house water, steam and oil pipe lines.

The Washington Wire

- No tax credits for preferred-stock redemption
- Neuberger schedules hearings on Columbia River
- Central Maine Power gets OK to buy Rumford Light

For the time being, at least, the U. S. Supreme Court has stymied utilities' efforts to establish federal tax credits for premiums said to redeem outstanding shares of preferred stock.

The court two weeks ago refused to review rulings against three companies by the U. S. Court of Claims on the issue, thus allowing that decision to stand.

The Court of Claims ruled a public utility is not entitled to a tax credit against income on premiums paid to redeem preferred stock. The utilities sought the same tax credit for such payments as they are given on dividends paid preferred stockholders.

The Supreme Court's action ends the matter so far as Idaho Power Co, General Public Utilities Corp., and Atlantic City Electric Co are concerned.

More Litigation Expected

But other companies in other courts are expected to litigate the same point. When and if a conflict develops between the lower court rulings, another effort at getting Supreme Court review can be made.

In fact, Kentucky Utilities Co now has a similar case pending in a federal district court. And, according to briefs filed in the unsuccessful Supreme Court appeal, at least 235 issues of outstanding preferred stock of various U. S. utilities apparently fit the same legal principle. No figures are available on the amount of money involved in these other cases; but it is enough to make sure that utilities will continue to raise the issue until the Supreme Court either directly upholds or reverses the Court of Claims' holding.

Though the circumstances and amounts of money involved vary, the facts in the Atlantic City Electric case illustrate the problem.

In 1944, the utility redeemed 26,283 shares of 6% cumulative preferred stock with a par value of $100 per share, for $120 per share, plus accrued dividends. The premium—here, amounting to $20 per share and totalling $525,660—is what the lawsuits center on.

The utilities claim that under a section of the 1939 Internal Revenue Code—substantially repeated in the 1954 code—such premiums amount to "dividends paid" stockholders, which the law allows as a credit against income.

So far, the IRS commissioner has been upheld in his contention that Congress, when it first adopted this section of the law in 1942, intended to cover regularly recurring, cumulative charges in the form of dividends on preferred stocks. Redemption premiums—since their purpose is to end stock ownership and the right to recurrent dividends —are thus considered outside the meaning of "dividends paid" in the tax law.

But in upholding the government, the Court of Claims admitted this point had never been decided before and that both the specific code provision and other general provisions applicable to the case "give rise to conflicting inferences."

• Sen. Richard Neuberger (D. Ore.) will hold four hearings on his proposal to create a federal corporation to integrate marketing of electricity in the Columbia River basin. The dates: Dec. 8 in Portland, Ore., Dec. 9 in Seattle, Dec. 10 in Coeur d'Elene, Idaho, and Dec. 11 in Kalispell, Mont.

Neuberger will have new proposed legislation drawn up by Nov. 1 to serve as the basis for the hearings. This bill is expected to differ from his previous bill (S-3114) by providing for more liberal bond-financing, and by setting up safeguards to protect the present power preference for public customers.

Bowing to other public-power senators in the Pacific Northwest, Neuberger has agreed to soften his proposal to raise industrial priorities for power marketed by Bonneville Power Administration or the proposed power corporation. He also does not plan to re-introduce his separate bill (S-2206) which would have placed federal power sales to industrial customers ahead of sales to power companies.

Printed copies of the hearings on the power corporation and preference clause bills (held May 21-23) are now available from the Senate Public Works Committee, Washington 25, D. C.

• Central Maine Power Co has received Federal Power Commission authority to buy the Rumford Light Co for about $1.5 million. Rumford's expanded load requirements made the tie to Central Maine necessary, as the alternative was to build a "substantial" amount of steam generating facilities, company said.

'Sell' Credo Sparks Growth, Says Carolina P&L's Sutton

A "sell, sell, sell" credo, which has been sustained beyond the lean Thirties, is a prime factor in the growth of Carolina Power & Light Co. Today, the credo has helped to raise residential consumption of electricity 43% above the national average, Louis V. Sutton, CP&L president, told a New York meeting of the Newcomen Society earlier this month.

In a description of the company's 50 years of operation, Sutton compared figures of 25 years ago with today. The utility's assets increased from $75 million to more than $325 million; generating capacity, 430,000 hp to 1.6-million hp; customers, 62,500 to more than 400,000; and gross revenues, $8.95 million to $67 million.

Sutton recalled CP&L's development of outdoor design of plants in 1908, effective use of inducement rates in 1934, and the independent operation following divorcement from a holding company in 1946.

CP&L's present proposed construction budget of $125 million through 1962 "is likely to be increased," he said. North Carolina Gov. Luther H. Hodges in introducing Sutton paid tribute to the utility president's leadership and the company's role in promoting industrial development.

Peeler Removes Insulation Quickly

R. E. L. SHIRLEY, Field Supervisor of Distribution, Georgia Power Co, Atlanta, Ga.

MORRIS BRENNER, Vice President, Engineering, Penn-Union Electric Corp, Erie, Pa.

A new cutting tool for peeling homogeneous coverings from conductors has been developed jointly by Georgia Power Co and Penn-Union Electric Corp. Use of the peeler, either by hand or with a hot stick, eliminates damage to conductors and provides a safer, faster, and easier cutting operation.

Development of the peeler stems directly from the tree problem. To minimize interruptions due to branches lying on bare conductors, Georgia Power installs PVC and polyethylene covered conductors in wooded areas. At 4 kv these conductors can be peeled using a knife. However, at 12 kv, conductors had to be de-energized, causing an outage; otherwise rubber gloves would have been required.

To overcome these problems, the two companies perfected the peeler. It resembles a hot-line clamp, but a blade is attached to the moving element in place of contact jaws. The blade is specially designed for one size conductor and one thickness of covering. By removing two screws, the blade can be easily replaced with another for a different size conductor and covering thickness.

In operation, the peeler is first hung on the conductor with a hot stick or by hand. Then the eye bolt controlling the movable element is tightened until it reaches a stop. At this point, the blade has penetrated the covering to within about 1/64 in. of the conductor. By rotating the tool a little more than 360 deg, the covering is peeled off and drops to the ground.

During the peeling operation, the cutting blade is rotated tangent to the conductor but never contacts it, so the conductor is not nicked or damaged. Covering between the blade and conductor is pulled off the conductor leaving a clean surface, free of particles, and ready for the installation of a clamp.

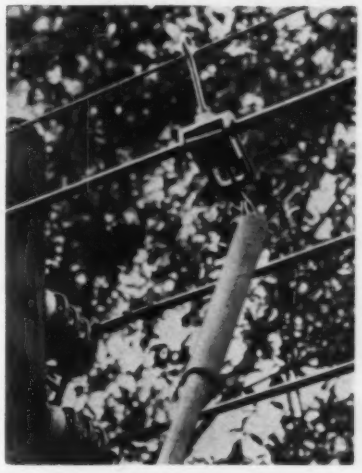
A lineman using a hot stick can apply the cutter and peel the covering in less than 2 min, after he gets in position. This time is considerably less than would be required using a hand knife.

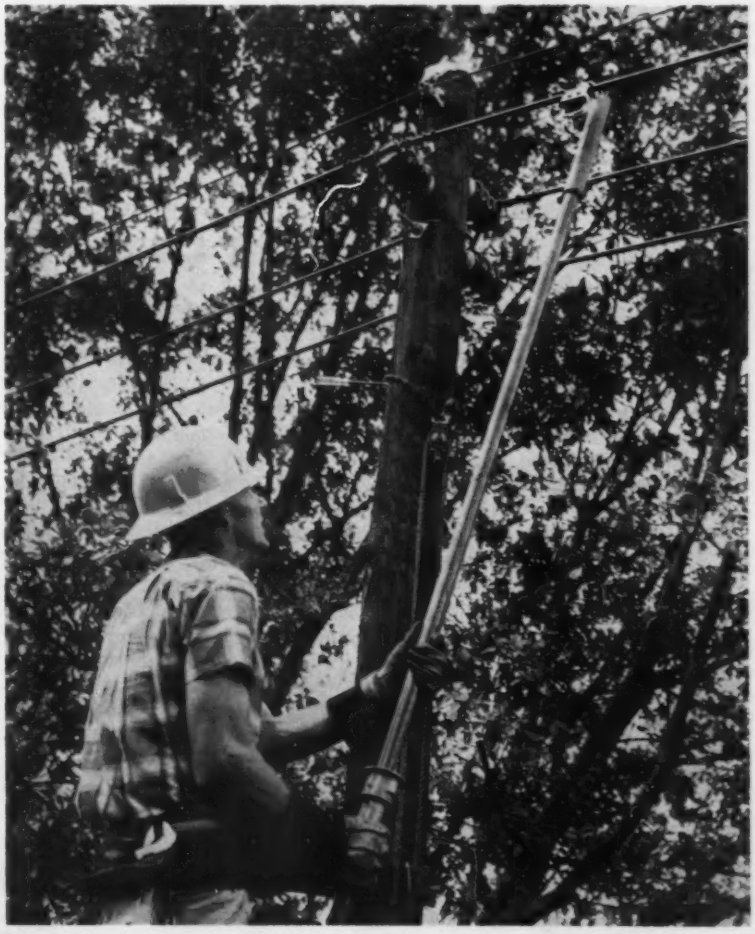
Other advantages are:

1. Improving safety by permitting the use of a hot stick, which obviates working directly on hot conductors.

2. Eliminating interruptions required when 12-kv lines are de-energized.

3. Obviating the use of cumbersome 20-kv rubber gloves.





C. K. GRAHAM (right), exiting as Indiana Electric Association president, hands gavel to E. W. Hebel, his successor. C. D. Rees, new vice president, looks on

IEA Theme: U.S. Encroachment

The creation of publicly owned utilities with tax-payers' money is a practice alien to the American free enterprise system, the Indiana Electric Association was told at its Oct. 1-2 convention at French Lick, Ind.

Thus spoke C. K. Graham, vice president of Southern Indiana Gas & Electric Co and the association's president. In the latter capacity he will be succeeded by Edmond W. Hebel, president, Public Service Co of Indiana. Carl D. Rees, vice president, Northern Indiana Public Service Co, succeeds Hebel as IEA vice president.

The taxes for which privately owned utilities are in part responsible, said Graham, are helping to create "uncompetitive, tax-dodging electric webs" which could smother those utilities. It was the private utilities, he added, that brought electric service to its present high level.

In the United States today, said C. E. Mannion, former dean of the University of Notre Dame's College of Law, private rights, personal liberty, and free enterprise are on their way out. The federal government, he added, has broken through its constitutional limitations and is exercising unlimited power recklessly.

Speaking of the government's agricultural policies, Dr. Earl L. Butz, dean of agriculture, Purdue University, criticized the government's guarantees of equality of reward in lieu of equality of opportunity.

A. C. Montieth, vice president, Westinghouse Electric Corp, reported that audiences for the "Power-Up" story numbered 42,000 in five months. He noted, nevertheless, that utilities have not upgraded their distribution systems to meet industrial needs as indicated by the fact that the market is growing faster than the labor force.

Although it is only 15 years since the first reactor went critical, a number of large nuclear power plants are already in operation in the world, said R. J. Kryter, consultant. A total of 1,326,000 kw of nuclear capacity has been approved and should be in operation in the U.S. by 1963, he added.

The power to tax free speech is the power to destroy it, J. E. Corette, president of the Edison Electric Institute, told the convention. He urged utilities to tell their side of the story concerning the recent Internal Revenue Service ruling which prohibits the deduction of advertising costs as operating expenses for tax purposes.

Such a program can be most effective, he said, when the utilities tell their story locally.

The Russians are building power plants about on a par with those in the U.S., said Edwin Vennard, EEI vice president and managing director. He was one of a group of utility executives who recently returned from a tour of Russia.

Atom Lead Held, Iowans Told

The interest of foreign scientists, particularly Russian, in the American exhibits at the Geneva Atoms for Peace Conference, should dispel doubt about American nuclear leadership, the Management Conference of the Utility Companies of Iowa was told at its Oct. 6-7 meeting at Des Moines, Iowa.

Such interest indicates that the U.S. is substantially ahead in overall atomic development, Sen B. B. Hickenlooper (R. of Iowa) told the more than 600 top executives of utilities throughout the state.

The investor-owned utility companies of Iowa have kept their 1951 promise to Congress to build transmission lines delivering federal hydroelectric power to the state's customers, said N. B. Gusset, president, Iowa Power & Light Co. Showing a map of 161-kv lines built or planned, Gusset said that the Iowa Transmission Grid is on schedule. Its progress, he noted, is being reported to Iowa's people in newspaper advertisements through out the state, beginning Oct. 6.

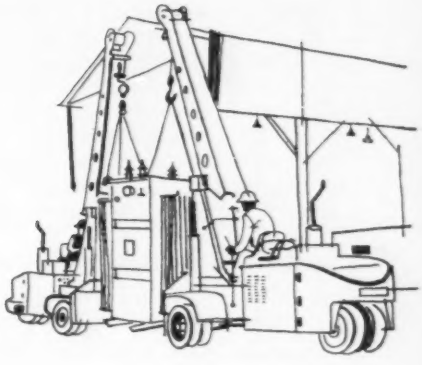
Iowa utilities maintain good public relations, said Henry Hook, publisher, The Davenport Democrat. Iowa utilities, he said, cooperate wholeheartedly with newspapers, TV, and radio; supply releases in professionally acceptable form; handle all requests for information frankly; respect deadlines; keep in touch with reporters and editors; and, release unfavorable as well as favorable news.

Dwight Van Meter, N. W. Ayer & Son, cited population figures showing that there are several million more women than men in the country. ECAP public opinion polls, he said, show that 41% of the people favored business ownership in 1943; 56% in 1957. But

(Continued on page 100)

PLAN '59 *Modernize now for growth and profits*

Modernize Service Functions to Meet Future Growth

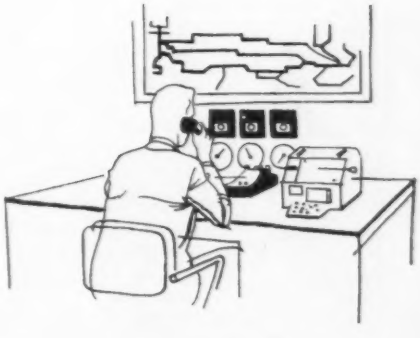


FRANCIS J. KOVALCIK, Middle Eastern Editor

General industry currently is in the trough between two boom-time crests. The rapid expansion of the early Fifties is well past. As yet, no one can say when the predicted boom of the Sixties will peak, or how long it will endure. But there are definite indicators that this next crest is on its way.

This boom will bring new growth to electric utilities which in turn will require additions to the service functions that are needed for effective and efficient operation. These necessary functions include accounting operations, warehousing and materials management, communications and protective relaying, general and local office buildings, and vehicles.

Time can be used advantageously now to prepare these services for the larger job ahead. Each function is one in which future cost-control measures can be planned. With the need for each function tied directly to the size of an industry that has new expansion ahead, it is important to plan the modernization of services to meet the coming growth.



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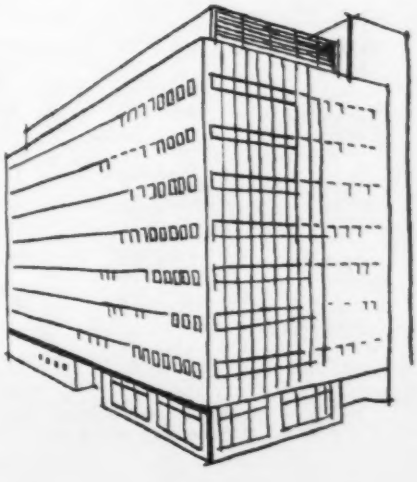
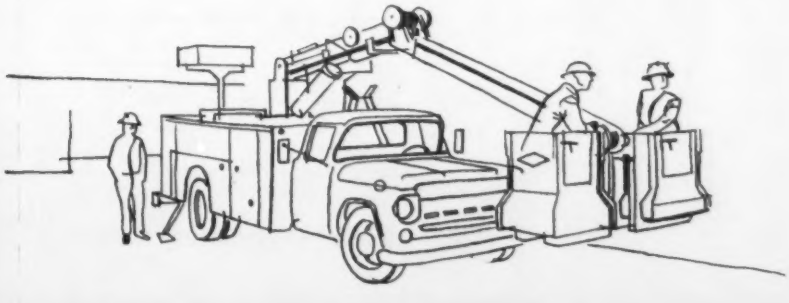
Modern Methods Bring Better Materials Management . . . p 69
The Need for Communications Will Expand . . . . . p 72
Growing Room Gained in New Buildings . . . . . p 74
Special Vehicles Cut Operating Costs . . . . . p 78





PLAN '59

Computer Changes Handling

Electronic data processing (EDP) based on the stored-program digital computer is bringing about a revolution in the fields of utility accounting and power system engineering. A growth curve of the computer's acceptance is reflected in many ways, but these two statistics are quite significant—Since 1955 more than 20 utilities have adopted or plan to switch over to methods based on the stored-program computer. Since 1953, over 250 programs for computer solution of power system problems have been prepared.

The biggest use of EDP equipment in the industry is in the accounting departments of utilities. Companies who have installed computers feel they are a large part of the answer to rising accounting costs and continued growth in all accounting operations. The former accounting methods lacked flexibility in scheduling of operations, had a lower degree of accuracy, threw the operation "out of gear" upon breakdown, and did not lend themselves to economical expansion.

Digital computing systems, however, bring with them initial growing pains. As the treasurer of one utility stated, "Application takes longer and costs more, and initial savings are less than originally anticipated. But our faith in the computing system for the future is not shaken."

Application of a large computer to utility accounting functions was pioneered in 1955 by Commonwealth Edison Co, which placed complete customer accounting for 1.2 million accounts on an IBM 702. Last fall the company switched over to the IBM 705 II, making the change in just 17 working days. Looking to the future, the company has an IBM 705 III on order.

Leading the way in 1955 with an intermediate stored-program computer was Wisconsin Electric Power Co. This company placed electric service billing of 420,000 customers on an IBM 650 computer at its Milwaukee headquarters. Additional functions include revenue analysis, rate conversion tables, and general ledger. One operation, programmed at a cost of $13,000, saves the company $20,000 annually. As others have done, Wisconsin

24 Utilities Adopt Stored-Program Digital Computers to

Company	Basic System	Aux. Units	Placed in Use	Electric Accounting Applications Installed	Electric Accounting Applications Planned	Eng. Uses
Appalachian Power Co	IBM 650	1	12/56	Cust bill, 600,000 accts (1); Bill freq; Revenue analysis; Accts rec	Matl & Supp; Payroll; Gen acctg	Several
Arizona Public Service	Rem Rand Univac I	17	2/57	Complete cust acctg, 155,000 (elec) accts, incl Revenue & Sales analysis; Payroll & Personnel recd; Cash vouchers; Cash div & Stockhldr rec; Budget & Forecasts	Matl dist & control; Vehicle acctg; Gen acctg; Energy acctg	3
Boston Edison	Rem Rand Univac II	6	(2)	.....	Payroll; Gen acctg; Billing & Revenue acctg, 500,000 accts	..
Cincinnati G&E	IBM 650 (Second unit planned)	1	4/56	Cust bill, 405,000 accts; Accts rec; Notice prep; Revenue & Rate analysis; Budget & Expense; Load studies; Plan trending	Forecasts; Matls & Supp; Oper research	2
Cleveland Elec Illum	Alwac III E	None	5/58	Lrg Comm & Ind cust billing, 6,000 accts	.....	3
Indiana & Michigan Elec	IBM 650	1	.....	.....	Cust bill, 280,000 accts; Payroll; Matls & Supp; Gen accts	..
Commonwealth Edison	IBM 705 II	27	5/57	Cust bill, 1,960,000 accts; Bond redempt	Oper research; Payroll; Labor; Stores; Prop rec; Stockhldr rec; Accts pay; Gen ledger	4
Connecticut Light & Power	IBM 7070	4	(3)	.....	Cust acctg. 445,000 accts; Payroll; Stores; Util plant; Accts pay; Journal entry; Gen ledger	..
Con Edison	2 IBM 705 II	11	5/56	Cust bill, 3,000,000 accts; Prop rec; Accts rec; Accts pay; Vouchers; Gen ledger; Inventory control; Dividends; Sales forecast	.....	..
Consumers Power	3 IBM 650	6	11/57 (1st)	Cust bill & acctg, 315,000 meters	Cust bill & acctg, 1,025,000 meters	9
Detroit Edison	IBM 705 II	20	11/56	Cust bill, 1,200,000 accts	Payroll; Labor; Stores; Prop rec; Stockhldr rec; Sales Forecast; Accts pay; Journal vouchers; Gen ledger	39
Duke Pwr	IBM 7070	15	(4)	.....	Cust bill, 700,000 accts; Payroll; Matl & Supp	

(1) Includes two associated companies.
(2) To be in use before Jan, 1959.
(3) Will be operating in about 18 months.
(4) Scheduled for operation in April, 1960.

# of Utility Data

Electric Power has a committee to determine which operations can be placed profitably on the computer, and to develop an overall program.

Some companies are feeling their way into the field of EDP for accounting. For example, Cleveland Electric Illuminating Co started out with one Alwac computer plus peripheral equipment on a "building block" basis. This equipment handles the billing of large commercial and industrial customers, about 6,000 accounts monthly. If the computer fails to bring the hoped-for savings, the company can revert to its former accounting methods.

However, CEI has said, "The computer is providing the means of doing a job more accurately and economically, and is providing a method for training employees in EDP applications." CEICo plans to add two tape stands to its computer.

Detroit Edison approached EDP by ordering two IBM 650's to get experience in stored-program and general programming techniques. Now the company has an IBM 705 handling customer billing for 1.2 million accounts, with the intermediate equipment

DATA PROCESSING CENTER of a large company presents the look of the new revolution in utility accounting

Prepare for Coming Growth in Accounting Operations

Company	Basic System	Aux. Units	Placed in Use	Electric Accounting Applications Installed	Planned	Eng. Uses
LA Water & Power	IBM 650	..	.....	Payroll; Labor dist	.....	..
No. States Power	IBM 709	..	.....	Cust bill, 900,000 accts	.....	..
Ohio Power	IBM 650	1	6/58	Cust bill, 480,000 accts (5); Revenue analysis; Accts rec	Accts pay; Matl & Supp; Payroll & Labor dist; Finan state; Deprec; Vehicle cost rec; Budget & Expense calc; Employe data	..
Ontario Hydro	Rem Rand Univac II	4	8/58	Rural cust acctg, 450,000 accts (about to be installed)	Matls; Inventory & Stock control; Payroll; Labor dist; Gen acctg	Several
Pacific G&E	IBM 705 II	27	1/58	Cust bill (6)	.....	..
Pacific Pwr & Lt	Electrodata DATATRON 205	41	8/57	Cust bill, 250,000 accts; Accts rec; Rate analysis	Payroll; Stores; Gen acctg; Const; Stockholders analy & Div prep; Transcription	5
Penn Power & Light	2 IBM 650	6	9/57 (1st)	Cust bill, 700,000 accts; Rev analyses; Accts rec; Payroll & Labor dist; Stores; Transp; Deprec	Cost & Budget control; Finan & Oper reports; Stores control	13
Philadelphia Electric	IBM 650	1	8/58	Payroll	.....	Several
Public Service E&G	IBM 650	2	11/57	Payroll; Stores; Deprec; Load studies	Transp	20
San Diego G&E	IBM 650	..	(7)	Cust bill, 300,000 accts	Gen acctg	..
Wisconsin Elec Pwr	IBM 650	2	8/55	Cust bill, 490,000 accts; Rev analysis; Unit of consumption analysis; Rate conversion tables; Gen ledger; 14 other accounting uses	Matl & Supp; Payroll & Labor; Sales analysis; Large ind cust index	4
Wisconsin P&L	IBM 650	1	4/57	Cust bill, 193,000 accts (8); Accts rec; Rev analysis; Merch acctg; Matl & Supp	Payroll & Labor; Transp	0

(5) Includes one associated company. Largely bi-monthly.
(6) First of 1,000,000 accounts now on computer.
(7) Plans to have all billing on computer by Jan, 1960.
(8) Electric, gas & water customers.

being used for engineering work. In planning for its first 650 computer, Consumers Power Co created a new department called central billing to take care of work handled at 14 separate locations. The company now has three 650 computers.

All-out conversion, a second approach to EDP, is typified by the installations at Arizona Public Service Co, Pacific Power & Light Co, and Consolidated Edison Co. With this approach there is no turning back to former methods. Preparation for and adoption of an EDP system includes the abandoning of traditional paper work systems, as well as modification or addition of facilities to handle the large computer system.

Arizona Public Service, with American and Foreign Power, Remington Rand Div of Sperry Rand, and Ebasco Services, formed the Arizona Computer Research Program, in May, 1956. Arizona PS installed a Univac I to handle five primary areas in accounting and to implement research in budgeting and forecasting, with emphasis on budgetary controls, and system operating problems involving interconnected system operation. In all, 78 problems were listed for "first priority" on the computer.

Two IBM 705 II computers are used by Consolidated Edison Co for customer billing of 3 million accounts, property records, accounts payable, inventory control, and sales forecasting. Last year Pacific Power & Light Co placed its Datatron 205 to work handling customer billing, accounts receivable, and other applications.

All-Out Approach Favored

The all-out conversion to a large-scale computing system is favored by Boston Edison, Northern States Power, Ontario Hydro-Electric, Pacific Gas & Electric, and Southern California Edison. Boston Edison will take delivery of a Univac II this month. Applications planned include payroll, general accounting, and billing and revenue accounting for 500,000 accounts. The company also has an LGP-30 computer for determining economic dispatch.

An IBM 705 II was chosen by Pacific Gas & Electric to handle its 2 million customer accounts. The first of some 1 million accounts, in the San Francisco area, now are on the machine. The entire operation, to take about 2½ years, is expected to save the company $1 million annually. In looking at other applications, such as payroll, materials and supplies and accounts payable, the company is studying the need for a second computer.

System-wide communications will be tied-in with a Univac II installed by Ontario Hydro Electric. By leased teletype and telephone lines, business data covering 450,000 rural customers from 103 area offices will feed into the installation at Toronto. Rental cost of equipment, including leased lines, will be $500,000 annually.

The use of other than the largest-size computers will continue to increase. Such computers are classed as intermediate and large-intermediate. Duke Power and Connecticut Power & Light each plan to install an IBM 7070 computer, a fully-transistorized unit adaptable for commercial and engineering use. San Diego Gas & Electric hopes to have all its customers on a 650 by 1960. As a general rule, any utility with 150,000 meters might justify an intermediate stored-program computer for all accounting and some engineering problems.

Wisconsin Electric Power Company made the move to a stored-program unit after starting with an IBM 604 calculator in 1948, and later advancing to the 607 and 608 units. Ohio Power recently adopted a 650 computer for customer billing after using electronic equipment for payroll since 1954. Appalachian Power and Wisconsin Power & Light made the move directly from manual means of accounting to stored-program units.

Stored-program computers, however, are not a strict requirement for electronic accounting. Atlantic City Electric, for instance, uses a Univac 120 punched-card computer. Its program of clerical automation ultimately will tie all accounting procedures into a unified system. Customer billing of 200,000 accounts monthly was started in 1955, with monthly revenue analysis and rate block analysis as by-products. Payroll, stores accounting, and accounts payable also are handled on the equipment with construction and continuing property records, and general accounting to follow.

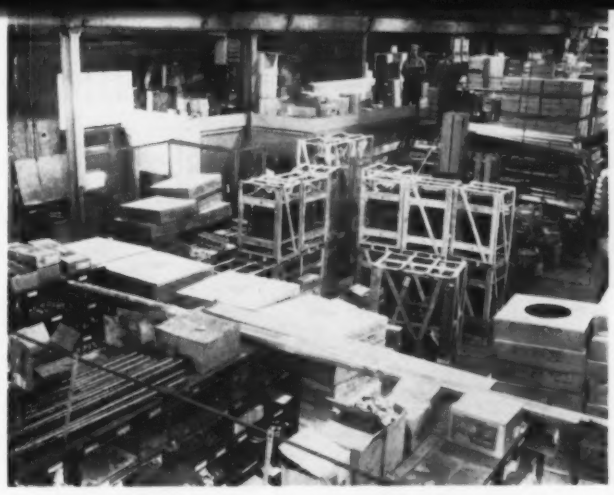
The computer revolution opens the way for engineers to concentrate on the problems to be solved. The computer will take over the time-consuming and routine calculations needed for solution. Already the computer has been applied to hundreds of power industry problems. Last January, AIEE published a list of 92 programs for stored-program computers; next year the new list will contain at least 160 more.

As engineers become proficient with computers, they will turn to the next class of problems—those that have never been attempted of solution because of the time and effort required. Optimum distribution transformer loading, distribution system design, optimum scheduling of system reserve, comprehensive long-range system planning, and lightning theory are problems to be applied to computers.

Use Smaller Computer for Engineering

Size alone is not the criterion of whether a computer can be used for engineering. The smaller computers, such as the Bendix G-15, IBM 600-series, LGP-30, Univac 120, and Burroughs E101, should not be overlooked for engineering work. Problems that can be solved readily on these units include economic dispatch, primary voltage drop and power loss, comparison of cooling tower sizes, radial system analysis, economics of secondary conductors, and probability of generator outage.

Advances in accounting and engineering will be accelerated by improvements in computer programming techniques which bridge the gap between the man with the problem and the machine. Compiler programming, using IBM's Fortran and Fortransit, and Rem-Rand's Math-Matic, instructs the machine through English-algebraic language to prepare its own programs. Companion compilers for business data processing, such as Rem-Rand's new Flow-Matic and IBM's Autocoder, will help in the programming of accounting problems.



Inefficient warehousing methods . . .

. . . give way to productive order

PLAN '59

Modern Methods Bring Better Materials Management

- New buildings or modernized older facilities are basic requirement
- Mechanized equipment and use of pallets will handle load growth
- Small crew center serves as operating point in suburban area

Utilities are giving more attention to materials management in recognition of the need to keep costs in line while preparing for future growth. Expenditures by utilities for stores equipment and materials are expected to climb to about $1 billion in five years from 1958's estimate of $680 million. By 1975 the figure is seen going over the $2 billion mark. This means that in five years 40% more materials, equipment, and stores will be moving into, through, and out of utility warehouses, storerooms, and work centers. By 1975, the work load will be 194% greater.

This increased quantity, plus factors of system growth, the size, shape, and weight of things to be handled, labor costs, and space limitations, are paramount considerations of warehousing and stores managers who are planning for the future. A survey of 26 utilities shows that plans for efficient materials management include newer facilities to maximize use of storage and working space and greater mechanization to multiply manual efforts.

Since 1955, new buildings were built at the same or new locations by 14 companies. One of these recently completed a general storeroom measuring 120x180 ft, with truck-height docks 20-ft wide on both sides. This new facility has an outside heavy storage area including new pole racks.

Warehouse modernization is necessary to take full advantage of mechanized equipment. One Midwestern utility modernized one of its warehouses and storerooms and gained about 1,700 sq ft of floor space. The company installed about 130 ft of palletized racks to accommodate up to 138 40x40-in. pallets; replaced wood shelves with 78-ft of steel shelving to store lamps, paint, safety equipment, and miscellaneous gear; and put in 50 wire coil racks. Steel bins to hold "exempt" minor materials also were installed to save time in issuing material.

Other new buildings are required because increasing load densities in suburban areas call for storage points for materials and operating points for crews nearer the work load. Large-scale service centers are the answer for some utilities.

To serve the Utica, N. Y., metropolitan area, Niagara Mohawk will build a $2-million service center and warehousing headquarters to house commercial, engineering, and operating personnel. A 38-stall indoor garage will take care of line trucks, trouble rigs, and other company vehicles. PS of Colorado is stating its third and fourth service centers, costing $1.8 million, to serve greater Denver.

Downtown congestion and load growth in the southern part of Oklahoma City prompted Oklahoma G&E to plan a $2-million general service center. This facility consists of a general garage, general stores, city operating headquarters, and general repair shops on a 70-acre tract. Three main buildings can be enlarged for growth beyond the planned 10-year period. Philadelphia Electric has completed a service building housing stores, overhead lines, service maintenance, and transportation activities to serve northeast Philadelphia. Materials in size up to cable reels, poles and transformers are

Progress in Materials Handling and Storage

(A study of 26 electric companies)

Since 1955, these means were adopted to make stores and warehousing more efficient:

	No. of Companies
New buildings	14
Palletize handling	14
Storage racks	11
Mechanized equipment	11
Storage bins or shelves	10
Reclaiming facilities	6
Relocated facilities	6
Standardized materials	5
Outdoor storage	3
Truck docks	3
Conveyors	2

These devices have contributed the most in cutting materials handling costs:

	No. of Companies
Forklift trucks	21
Mobile cranes	18
Hand trucks or trailers	17
Monorails and conveyors	10
Elevators	8
Wire-reeling machines	4
Cargotainers	3
Baling machines	2

Devices reported once include portable loading ramps, self-levelling dock, stackers, and lift-gates on trucks.

To complete the warehousing operation, these actions may be taken within two years:

	No. of Companies
Replace old buildings	6
Relocate facilities	4
Add narrow-aisle stackers and forklifts	3
Add loading dock	3
Palletize handling	3
Use vertical storage	1
Add standard stackers	1
Conveyors	1

stored there. A similar arrangement to serve its districts is used by West Penn Power Co.

Small-scale work or operating crew centers throughout the metropolitan or service area is another answer to suburban load growth. This approach is used by Union Electric, Detroit Edison, Cleveland Electric Illuminating, and Ohio Power Co. CEI, for example, will build six work centers to serve the Cleveland area. Centers are located on the basis of a 10-year forecast of work-load trends. Line trucks, service trucks, and cars, 16 in all, will be garaged at each center. Only minor maintenance, plus washing, gas and oil and greasing, will be provided. The center also will be the line crew headquarters, and receiving station for material from the main warehouse. Material will be delivered in "job-sized" packages by flat, open truck-trailer.

For better handling, CEI is considering a stake-bed supply trailer (towed by line truck) which will take a removable platform loaded with the day's material and brought from the warehouse by open truck-trailer. In supplying these work centers, material such as reels of triplex wire are charged out from the main warehouse and picked up by center personnel. Based on historical cost records, cost of such material is charged in the proper amount to operating and maintenance property accounts.

A southeastern utility is reorganizing its line crews and service center set-ups to use line crews of 5 or 8 men. A maximum of three crews will operate from each service center in one of the company's larger divisions. All crews will be equipped with a truck and a trailer. In addition, the 8-man crews will have a pick-up truck.

Mechanization is accelerating the use of palletizing, as reported by 14 utilities. These utilities reported: Using adjustable steel pallet racks in all new buildings and many older ones; specifying the purchase of such materials as fiber conduit, electric meters, insulators, arresters, and reeled triplex service wire on pallets (disposable in some cases) for ease in handling; placing items like cartons of firebrick, pulverizer mill balls, Transite conduit, and concrete spacers on pallets or in pallet boxes for damage-free storage.

At Duke Power Co, almost every item in the warehouse is stored so that only one man and a forklift with hydraulic-powered adjustable forks can handle it. Wire reels are laid on one flange in storage; they are picked up with the forks under the upper flange. Another Southeastern company is considering the palletizing of transformers after they have been repaired to minimize damage.

Mechanize Handling Methods

Efficient materials management is based on the maximum use of mechanized equipment, the most versatile unit being the forklift truck, with mobile cranes second. "Forklift trucks are a major factor in lowering costs and increasing efficiency," says Cleveland Electric Illuminating. "The forklift has doubled storage space by making air space useable.

One large metropolitan utility uses the following mechanized units to handle material, supplies, and equipment in warehouses, maintenance and repair shops, and district storerooms: 10 rider-type forklifts, capacity of 6,000 lb; 19 walk-with lift trucks, capacity of 3,000 lb, lift of 124 in., and 36-in. forks with 48-in. extensions; a 3,000-lb walk-with lift truck with 68-in. mast height to negotiate low clearances; and a narrow-aisle (8 ft) lift truck with outriggers and special winged pallets. Attachments for the forklifts and lift trucks increase their usefulness. A swivel hook and sling on the forks provides a crane; an 8-cu ft scoop provides a bulk loader; and fork extensions allow wider loads to be lifted.

The company also uses a pallet transporter at its warehouse, and at all generating stations and suburban storerooms. This unit has a 6,000-lb capacity, 9⅜-in. wide forks of 27-in. overall width,

FROM TIME OF ARRIVAL until being sent to field, material and equipment should be handled by forklifts

ADJUSTABLE RACKS or shelves have the flexibility to accommodate many odd shapes and sizes at low cost

48-in. length. It has a power lift of 4 in. making forks 7¼-in. high when fully raised. Other equipment includes five 72-in. lift and four 17-in. lift 6,000-lb platform trucks to carry heavy material loaded on skids or in bins; two 10,000-lb rider-type electric cranes, one with a 19-ft telescoping boom; and a 20,000-lb lift truck with 60-in. forks and auxiliary boom. Heaviest of equipment and material is handled by a 12-ton electric crane with a 30-ft boom, or a 20-ton crane with a 30-ft jointed boom and 20-ft extension.

Reel-handling equipment consists of a 11,000-lb jack that will take up to 50-in. wide, 72-in. diameter reels; one large and four smaller automatic reeling units with hydraulic lift and electric drive; and carts for carrying reels vertically or horizontally.

Low-cost materials management requires that attention be given to storing materials to make full use of storage space. Thus, 10 companies report using storage racks and 11 use of bins or shelves. One utility first installed racks in 1956 for storing guy wire coils; now it has 250 racks. Elimination of extra handling has cut time for storing guy wire by 45%. With the four-high racks, space requirements over pallet-stacking is reduced 42%. Coiled wire is shipped by the rack-full to divisions to save handling.

Another utility has built single and double-sections of erector-type steel shelving two tiers high to hold lamps, safety equipment, and office supplies. This 720 cu ft of storage space is worth about $150 per month at the local rental rate. A similar rack stores guy grips, armor rods, and splices. Depth of the rack allows easy handling and counting.

Operation Grab Bag involving open storing of exempt materials on racks and in bins in district storerooms will save Connecticut Light & Power $10,000 annually through reduced paperwork. A week's supply of 97 different items is available where linemen can take their daily requirements.

PORTABLE HOPPERS and containers facilitate handling of rubbish, reclaimable scrap, and excavated earth

TRAVELLING STOREROOM of Niagara Mohawk carries line materials to 28 crews in the Albany, N. Y., area

PLAN '59

The Need for Communications

Microwave and space radio will have larger roles on utility systems

The need for more communications facilities within the industry is dependent upon the changing complexion of individual systems. While the general trends in system growth will follow historic patterns, there will be marked changes in particular parts of the systems. Average capability per station will rise, while the number of stations will remain near constant. Voltages and power levels of transmission lines will go up, and concentrations of power in bulk-power substations will increase. The number of systems interconnections will spurt upwards. The growth in number of distribution substations, their capability, and their loads will pick up. The trend to centralization of managerial and business services will grow stronger.

These factors will require that greater attention be paid to operating efficiency, system control, and managerial service activities. Thus, it is expected that the need for communications will rise faster than general system growth. To provide channels for these communications needs, electric utilities will make greater use of microwave and space radio.

Microwave systems for many forms of communications have grown fast since this medium came out of the "experimental" stage about 1953. In 1957 there were 13,700 route-miles of microwave channels, with 1,028 transmitters and 513 stations. By 1970 it is estimated there will be 26,000 route-miles, 3,480 transmitters, and 1,160 stations in operation on electric utility systems. Applications of microwave are listed in the accompanying panel.

Microwave systems usually are associated with distances of more than 10 miles between terminals. However, microwave for distances of 4 to 6 miles has been installed by Southern Nevada Power. Six substations on the company's transmission belt around Las Vegas are tied to the dispatcher's office at a seventh substation. The 2,000-Mc microwave loop carries protective relaying, telemetering, supervisory control and voice.

Space radio for voice communications associated with system operations will continue to grow. Any slack in growth will be taken up by new non-voice uses of radio. One utility plans to send alarms from unattended substations to a control point via radio. A sealed mobile transmitter will send a coded signal to identify the station. This scheme boasts lower cost and greater reliability over other methods. Close to 100 substations will be so equipped eventually, with the first installations going where no leased lines are available. The utility also is considering radio relaying of circuit breakers.

In another installation, an fm transmitter is used as an automatic outage indicator to report opened protective devices for Lorain-Medina Rural Electric Cooperative (EW, Sept. 15, 1958, p 53). For better use of its mobile radio system, Central Illinois PS uses a tone-coded squelch to stop skip interference (EW, Sept. 8, 1958, p 74). Some companies are using radio to signal vehicles to call in.

CARRIER TERMINAL couples 56-kc system for voice and supervisory to insulated shield wire on 115-kv line

Carrier will be Used

Although carrier communications has seen its major growth, its use will continue and even expand some. As an example, wire-line carrier has definite advantages in metropolitan areas over other means of controlling tie-lines less than 10 miles from the control point. In extending its microwave system, Cleveland Electric Illuminating will use a co-axial cable to provide a 24-channel (minimum) circuit for protection of a pipe-type cable and for communications and supervisory services. This 3-mile co-axial circuit will be laid in a duct line.

Carrier current is being used by Baltimore G&E to automatically control shunt capacitors on 4-kv distribution feeders. This 60-kc carrier scheme will use a modified transistorized receiver, a tuned-reed frequency-sensitive relay, and a control function which initiates operating signals to meet requirements and has feedback supervision. One Southern utility is considering the use of leased telephone circuits for switching capacitor banks in substations.

A southeastern utility is using insulated shield-wire carrier on 110-kv lines to transmit voice communications. One 186-mile circuit operates over a 1/0, 7-strand (4 steel, 3 aluminum) conductor

Will Expand

to provide four channels in the 3-35-kc range. Over 44 miles of this circuit a 39-49-kc channel was added. The second circuit operates over a ½-in. SMDG steel wire to provide (1) a 94-mile 11-22-kc channel; and (2) a 51-mile, 23-35-kc channel.

Another southeastern company has found insulated shield-wire carrier on 115-kv lines effective for a supervisory control of substation as well as voice communication. Three years experience has proved the versatility, low-cost, lower carrier attenuation in most cases, and lack of effect on lighting performance of the scheme. To expand the scheme, the company installs an insulated ACSR shield wire on all new transmission lines over which supervisory carrier might be routed.

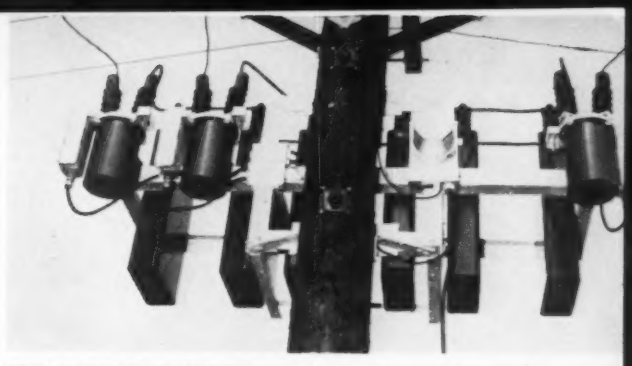
Frequency-shift carrier coupled to a 12-kv feeder is used by Commonwealth Edison to control a remote diesel generator. The carrier has performed reliably at a 100-kc frequency despite high attenuation of the channel. Telephone-line carrier to control an unattended cable-oil pumping plant is used by an eastern utility. This time-division multiplex scheme provides five points of supervisory control, 15 alarm points for off-normal equipment, and continuous telemetering of oil level and pressures.

Uses for microwave (accompanying panel) include a number of applications involving protective relaying. These followed the improvement in microwave until a high degree of reliability and security could be assured the user. It followed naturally that this proven channel should be wed with protective relaying to improve the protection of expanding and more complex systems.

One of the newer microwave relaying techniques is transfer-tripping of transmission circuits. Boston Edison uses a 4-mile 2,000-mc channel to protect a pipe-type cable. A more extensive microwave system has been planned to protect two-terminal and multi-terminal 138-kv lines of CEI Co. The relaying system consists of 130 relay channels at 15 locations used for transfer-trip and permissive zone comparison schemes. Commonwealth Edison selected transfer-tripping via microwave for remote tripping at many locations on its 138-kv system.

Transfer-tripping by audio tone on telephone pairs is used by Philadelphia Electric to protect power transformers which have only one local breaker (high or low side). The scheme uses two guard and two trip tones. Six installations planned or in service are on lines from 66 kv up and for transformers rated 40 to 200 Mva. A Southeastern utility uses two schemes for three terminal lines where the tap transformer has no fault-current source. For small substations with fuses on the transformer primary and for large tapped stations having breakers on the primary, one scheme uses directional-comparison carrier blocking. When the tapped transformer has no fuse or automatic breaker on the primary side, differential relays on the tap transformer cause the remote ends to trip.

Two companies provide local back-up protection



SEALED RADIO RECEIVER provides remote switching of capacitors on 4-kv system of Baltimore Gas & Electric

to segments of their systems which are vital to system stability. Philadelphia Electric developed a local back-up scheme for its new 750-Mw Eddystone Station using entirely separate relays operating from separate instrument transformers. Only failure of the station battery will allow a fault to go uncleared. More generation at Northern States Power Co's High Bridge Station made it difficult to retain remote back-up of 115-kv lines emanating from the 115-kv ring bus. With breakers and CT's available in the bus-tie breakers, only back-up relays, a potential source, and a separate dc source were needed to complete the local back-up.

Current-compensated reactance ground relays have been applied to all new 132-kv lines of Public Service Electric & Gas and added to some older lines to maintain fast back-up clearing of ground faults. There are 41 terminals of reactance ground relays in service, five of which use the ground relay for carirer control as well as back-up.

Back-up protection will guard against malfunction of an oil circuit breaker at Duke Power Co's Allen Steam Station. Back-up will clear the bus, in a 1½-breaker scheme, and trip the remote end of the appropriate 230-kv line if required.

Microwave Handles Many Functions

What Microwave Does:	EW Issue Date
Supplements Present Communications	Jan 1, 1949
Proves Dependable in Action	Dec 18, 1950
Relieves Overloaded VHF Circuits	Jan 12, 1953
Handles Protection and Control	Jan 12, 1953
Links Hydro Plants	Jan 12, 1953
Protects 132-Kv Tie	June 1, 1953
Backbone of Communications	Oct 19, 1953
Links Dispatcher to Station	June 28, 1954
Provides System Communications	July 12, 1954
Links Commercial Offices	Oct 17, 1955
Provides Transfer-Trip Relaying	Feb 11, 1957
Televises Meter Readings	June 17, 1957
Planned to Meet Growth	Jan 6, 1958
Transfer-Trip Protects Transformers	Mar 10, 1958
Relaying Covers System	July 14, 1958
Protects 3-Terminal Line	July 14, 1958

PLAN '59

Growing Room Gained in New

New quarters bring benefits of consolidation, better morale and rentals. Electronic data processing is a factor in planning

GULF STATES renovated the interior of an old hotel building to provide 22 floors of modern office space

CLEVELAND ELECTRIC as major tenant holds six floors in the Illuminating Building. CEI has 30-year lease

Roughly half of the medium to large-sized electric utilities in the nation since the end of World War II have remodeled, built or are leasing new general office buildings. As customers increase and as word of the benefits from headquarters modernization gets around, it seems probable that a large percentage of the other half soon will follow suit.

Matching the industry's own projection of load growth, the headquarters activity of all utilities too is growing. Sooner or later each company must make room to contain past growth and allow for future expansion. How to provide this growing room is the problem. A course of action may be found by looking at how utilities have provided space not only to contain past growth but also for the future:

1. Modernize existing structures.
2. Build or lease a new structure downtown.
3. Select a new building location in the suburbs.

The story of Gulf States Utilities typifies the growing-pains aspects still existing in many general offices. About 300 administrative and office people worked in a group of buildings, one of which was owned by the company, in downtown Beaumont, Tex. Additional space was urgently needed.

Gulf States' solution was just across the street. When the old Hotel Edson was first put up for sale in early 1955, there were no takers. In the start of "Operation Skylark," the company rented space in the hotel so its engineers could check the possibilities. They reported that with complete modernization the 23-story building would make an excellent headquarters.

The sale was consumated in September, 1955 and the conversion began the next February. Twenty-two of the 23 stories were gutted until only the shell, floors and skelton remained. By August of last year the building had 277 offices ready for use on floors 8-19. Except for one floor leased to a private club, the remainder of the building is available for the utility's use in the future. One feature of the Gulf States building is central control of engineer-room and individual-floor equipment. One operator controls temperature and pressures for the whole structure.

A new office building downtown can be a shot in the arm for the whole community. In explaining the move by Cleveland Electric Illuminating, G. H. Lockwood, supervisor of office planning unit, said: "We were primarily interested in revitalizing downtown Cleveland. No large office buildings had been built in the downtown area since 1930."

Instead of building a new office or redoing the old one, CEI is renting six floors of a new building next door to one of its old structures. Those six floors provide nearly 17% more space than CEI had in 14 floors. The building cost $17 million. CEI's decision to be a tenant gave the owners their major impetus. In return, the structure is named The Illuminating Building. Expected growth five years ahead was planned for by CEI.

Office Buildings

The Illuminating Building is a showcase for power customer prospects. Two-zone air conditioning keeps employees cooled or warmed at just the right temperature, whether they're situated near windows or in near the elevators. Lighting is at 100-ft-c levels. An underfloor duct system for wiring and communication lines has been designed to keep the CEI floors ready for innovations.

The first stainless-steel curtain-wall office structure in Ohio was the choice of Columbus & Southern Ohio Electric for its new building in downtown Columbus. The $5-million, nine-story building will house 640 employees, includes two auditoriums and two training kitchens. Display areas will be available to Columbus electrical manufacturers.

The building is the largest built in the city in 25 years. It was designed for minimum maintenance expense without sacrificing attractiveness. Temperature control is provided by a 550-ton air-to-air electric heat pump.

Consolidation Brings Savings

Employees quickly become sold on new headquarter activities. Many of the changes have brought new or improved eating accomodations, recreation rooms, auditoriums and, certainly, better working conditions. And management is pleased, too.

Washington Water Power, for instance, estimates that savings of nearly $100,000 a year are possible because of its new $7.5 million central service facility along the Spokane River. Savings will flow from: Consolidation of activities from 17 previous locations in a central point, and savings in maintenance, heating and operating costs.

The facility includes a new five-story office building and a service center, with shops and warehouse, garage and parking areas, which was completed two years ago. A third new building is a 300-seat auditorium-cafeteria, with an "all-weather" outdoor dining terrace. All three buildings are heated by an electric heat pump. Lighting levels in the office building range from 30 to 170 ft-c.

California Electric Power is working both sides of the modernization street. Its $1.7-million general office building in San Bernardino is directly across the roadway from its $1.35-million service center in Rialto. In moving out of Riverside, the company established itself in a "nerve-center" location of its service area.

About $150,000 was spent in furnishing the general offices. Much furniture and equipment was brought over from three separate structures occupied in Riverside. Consolidation has enabled Calectric to put its construction, right-of-way and engineering departments, for example, conveniently near each other. Similar groupings have improved work flow for the controller's office, tax department, treasurer and machine accounting.

Furnishings won't be a problem for Sacramento Municipal Utility District when it moves into its new building next year. The District came into being in 1947, so desks, files and other equipment are still in good shape. The new $5-million, 350,000-sq ft building is expected to provide enough space to accommodate a staff in 1965 sufficient to serve up to 250,000 customers, compared with about 135,000 today. There will be building area for expansion to a 300,000-customer count or possibly more, according to Paul E. Shaad, assistant general manager. The SMUD headquarters will have a heat pump, an average lighting level of 150 ft-c, an appliance display area, and employee parking.

WASHINGTON WATER POWER built an administrative and operating center to save about $100,000 annually

Seattle City Light is spreading out and up in the seven-story addition to its office building and modernization of the first two floors' exterior. Building foundations will support tower floors of about 64x126 ft. To overcome this restriction, cantilever construction was used to extend the building out 12 ft on three sides. The added floors are 76x150 ft, a 33% increase in floor space.

Cost for City Light's addition and renovating will be $3.7 million. At least five floors had been deemed necessary, while engineering studies showed "we could add a total of only seven floors," Raver said. "Rather than build only six floors to take care of current needs, we decided to add seven floors now and rent one and two-thirds floors to the City Water Department." This will provide for expected City Light office expansion during the next ten years.

Utilities with a change in prospect should carefully weigh remodeling existing structures vs building new ones, and staying in the downtown area vs a move to the suburbs. Public Service of Colorado is a good case in point. The approaching expiration of its lease on a 50-year-old downtown Denver structure led to a study of the problem.

To buy and remodel the old building would have taken five or six years and cost about $6 million, almost as much as for a new 10 or 12-story structure. Electronic accounting and billing equipment would have been limited to the one floor in the building with enough ceiling height to permit underfloor ducts. The trend of downtown building would have imposed a risk of PSCo being away from the mainstream of downtown activity.

Despite higher land cost and costlier vertical construction, PSCo wanted to remain in the business section. The main reason was that it would help preserve property values there. Then too, fac-

tors of mass transportation, a central location, shopping conveniences, and proximity to good restaurants outweighted possible advantages of locating on the edge of the city. With the help of space-planning consultants, PSCo looked ahead to 1984 to see how many employees it would need and the square foot requirements per employee.

The utility now has offices at five scattered locations. The new building will consolidate these operations; provisions have been made to expand these new facilities as needed. PSC has "decided to build rather than lease a building to obtain maximum efficiency and provide for future growth."

Taking the opposite approach, Georgia Power will lease a new general office building it is planning for downtown Atlanta. The utility sees these benefits of leasing as paramount:

1. Long-term cost will be less because the lessor can raise a greater ratio of debt money.

2. Capital can be used for more productive facilities during rapid expansions.

The new building is needed: (1) to house all employees, (2) because of use of electronic accounting equipment, and (3) to group related departments, now remote from each other, for more efficient operations. A key factor in any leasing decision is "importance to the business," not just economics, says Georgia Power. Thus, the company will own a new general service headquarters near Atlanta. Such a facility is not replaceable easily.

Tampa Electric Co chose a move to the suburbs for its two-story office building and one-story Leisure House. Located on 7½ acres away from the business district, the facilities cost about $1,750,000. The "Leisure House" title is something of a misnomer because employees there are hard at work staging homemaking classes, parties for customers and meetings. The 54,000-sq ft structure houses a cafeteria and provides a handsome setting for the demonstration of lighting and electric appliances.

Decision to own, rather than lease, the facilities is based on an extensive study. Tampa Electric found that owning would be more economical because of the tax-set-up and because self-financing would cost less than leasing over the long term. The general office provides space for seven years of growth, or for 33% more employees. Ample parking space and better facilities have improved employee morale and operating efficiency.

Another suburban newcomer is Salt River Power District, Phoenix, Ariz. Its 77,000-sq ft building is of a cross design situated between Phoenix and Tempe. The two-story unit is 307x279 ft with 79-ft wings designed for expansion. It was built and furnished for $1.3 million, including land costs.

All offices except maintenance, warehouse and fleet yard are in the new building, which has a cafeteria, air conditioning, and louvered windows that automatically shut out excess sunlight. Savings are affected by assembling the previously scattered operations of the District under one roof.

To best house Pacific Gas & Electric's electronic data processing system and related offices, an eight-story existing building was purchased for about $1,250,000 and remodled. The top floor, with a 16-ft ceiling height, was picked for EDP equipment. Modernization there included open-web joist construction of a raised floor 10-in. above the building's concrete floor. This permits direct-line cable connection between machine components, keeping cable lengths to a minimum. A separate 1,000-amp, 3-phase, 4-wire 120/208-v bus feed was installed for present and future accounting equipment load.

No pat answers are available on the questions of where to locate or whether or not to remodel. For any utility contemplating a move or change of its general office, the $20,000 to $25,000 cost of a study of alternatives can pay dividends.

SEATTLE CITY LIGHT built maximum addition to save future cost. It will rent extra floor space until needed

TAMPA ELECTRIC chose the suburbs for its new building. Sales-promoting Leisure House is next to the office

SALT RIVER POWER built in the center of its activities. Building design adds to efficiency of data processing

AFTER-HOURS PAYMENT of bills may be made at nearly all of Carolina Power & Light's new offices. Located in a shopping center, this office building has sales and display space, electric heat pump and service quarters

District Offices Meet Local Growth

New district or local sales office buildings are being pushed by electric utilities with the same vigor being applied to new general office buildings. An informal study by Electrical World shows that 19 utilities throughout the country have built 82 new buildings and remodeled 20 in the last five years. They plan to build at least 46 more in the next two years. Facilities generally going into these new buildings, and their acceptance among 15 utilities, are given in the accompanying table.

An example of the kind of local office being built is the new Bellaire office of Ohio Power Co. The 66x68-ft, one-story structure, located on a corner, will have display windows along both streets. Exterior of the building will be brick with stone and aluminum trim. Lights in the roof overhang will illuminate sidewalks and the building exterior. The office will have an electric heat pump, a demonstration kitchen, a 62-seat auditorium, lobby, and office space for 20. Cost will be about $172,000.

Most utilities locate the new buildings "downtown" for customer convenience. Southern California Edison says, "We try to locate in a commercial area in the principal city of the district, near to but not actually in the downtown business area." And Salt River Power District says, "We try to locate branch offices near the center of residential districts for easy access to the people in that area." Companies like Pacific Power & Light, with far-flung service areas, build some combination office building-service centers; where office buildings downtown can be modernized, the service center is built at the edge of town.

One southern company also is doing a job on its older office buildings. They report the installation of 21 heat pumps in new or remodeled offices during the last five years. This company has plans for four new offices, and the remodeling of three more in the next two years. This company prefers to locate its new offices on the edge of the existing business area.

A Pacific Coast utility says it uses a variety of exterior finishes on branch offices, "but always a glass front." As revealed in the study, most utilities have the glass front, plus an exterior of brick or concrete block with aluminum, stone, wood, porcelain, terra cotta, glass block, or stainless steel.

Setting the Pace in New District Offices

(A Study of 19 utilities)

New offices built last five years	82
Offices planned for next two years	46
Offices remodeled last five years	20
Location of new offices:	
Downtown or near commercial area	56%
Edge of town	31%
In shopping center	13%
Offices of only one story	73
Size of office, sq ft	
Minimum	1,000
Maximum	250,000

Facilities reported by 15 utilities:	
Exterior night lighting	87%
Sales area	80%
Display windows	80%
Parking lot	80%
Auditorium	67%
Demonstration kitchen	67%
Heat pump	53%
Drive-up pay window	40%
Resistance heating	27%
Air conditioning only	23%

PLAN '59

Special Vehicles

Special vehicles for only one or a limited number of uses can cut the cost of the operation sufficiently to justify the vehicles. This is the experience of many utilities. Special units are finding uses in construction of overhead and underground lines, in transporting materials between the supply point and the work site, and in handling materials and equipment at the operating center or storage area.

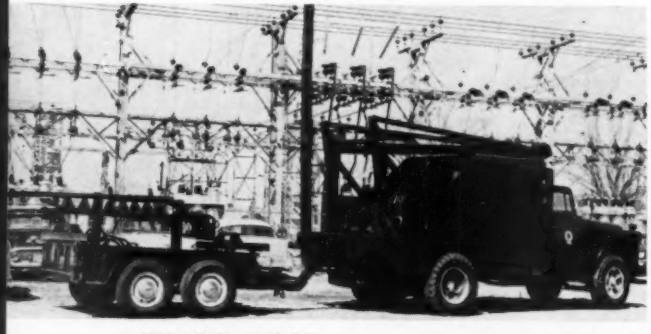
Greater benefits sometimes flow from a special-purpose unit than are anticipated initially. Cleveland Electric Illuminating, for example, bought a $2,000 gasoline-powered tamper for compacting soil. Now the device is used by CEI crews as a roller or leveler in the patching of asphalt paving. The device saves about $6,000 annually over the cost of having city forces do the work.

A southeastern utility uses a short-wheel-base truck, fitted with 14x20-in., 12-ply tires, to dig holes for transmission structures. The four-wheeled vehicle mounts a 30-in. auger which digs 16-ft holes. Compared with a truck-mounted digger, this special unit can traverse more difficult terrain and is easier to position. It can make a maximum speed of 50 mph on the highway.

One man can operate a new type of excavator developed by Duke Power for use on a 6-ton truck-mounted crane to dig holes for tower foundation grillage. The excavator consists of a modified ⅜-yd clam shell bucket attached to 4-in. pipe leads. A braking system prevents the clam shell from rising as it "bites" into the earth. The unit can dig holes larger than 2x5 ft to 12-ft depths.

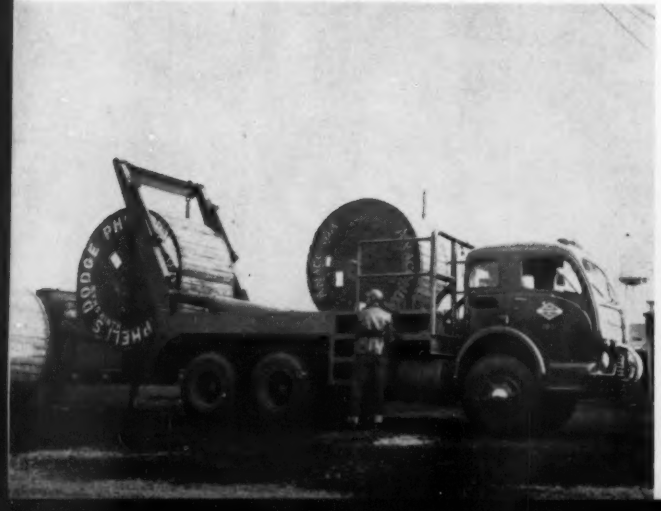
Another southern company uses a truck and

PUSHBUTTON PANEL developed by Portland GE allows the operator to control crane from outside the cab

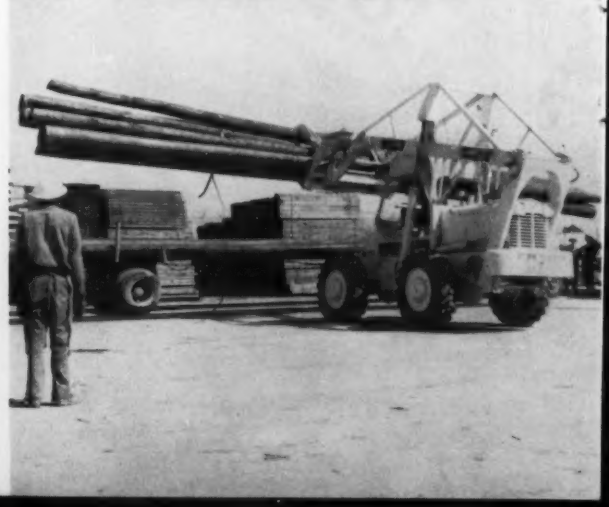


HYDRAULIC POWER drives winch, auger and derrick. Trailer carries hydraulic accessories and line materials

LOAD LUGGER of Philadelphia Electric will load and carry one 18,000-lb or two 12,000-lb reels of cable



LIFT TRUCK of Salt River Power District can reach to 10 ft and handle up to four 75-ft poles simultaneously



Cut Operating Costs

trailer combined with hydraulically-operated accessories to improve the efficiency of 5-man line crews. The truck has a hydraulic derrick and hydraulic winch for better control. The trailer carries the auger and connecting hoses, as well as poles, transformers, and line material.

Special street-light maintenance trucks are used by CEI to cut the cost of cleaning and relamping. Each truck has a hydraulically-controlled elevator platform which will reach to a 34-ft height and extend 11 ft to right or left. The truck body contains washing tubs and a drying rack with room for replacement street lamp bulbs. While annual rental of the three trucks is about $25,000, savings per year are $34,000.

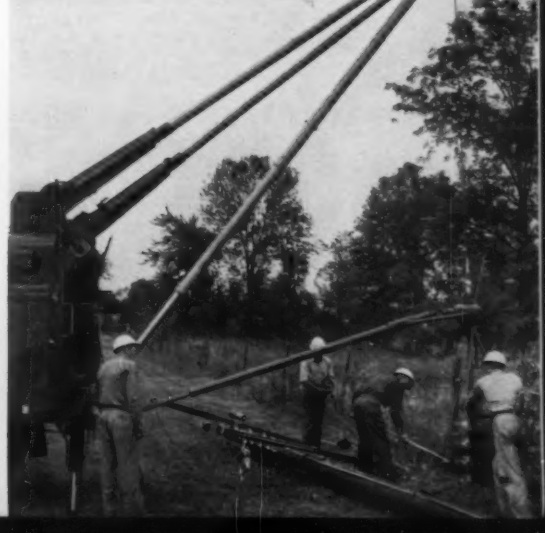
In recent additions of special equipment for more efficient operations, Niagara Mohawk added its 50th articulated aerial-boom truck, a new mobile crane with 75-ft boom and 25-ton capacity, and a new tractor-trailer for hauling long poles or pipes.

An articulated boom and insulated basket will be added to a service truck by a southeastern utility. The vehicle will be used by 2-men crews in trouble shooting and for running services. Maximum elevated height of the basket will be 30 ft. The first few trucks will be assigned to linemen with physical handicaps so that they may continue to use their electrical skills. A small trailer is being used by one utility to carry a large reel of service cable. The reels rests on its side on a turntable so that servicemen can pull cable in most any direction. The reel can be handled on and off the trailer by forklift. The unit rides on two swivel-type wheels.

MAINTENANCE VAN for street lighting contains washing tubs, drying racks and space for replacement bulbs

SOIL COMPACTOR saves about $6,000 annually for Cleveland Electric in the patching of asphalt pavement

POWER ACCESSORIES extend the flexibility and efficiency of standard equipment. Public Service Co of Indiana uses front-end winches in replacing transformers and light auger driven by power takeoff to dig holes



Leasing and Small Cars Lower Costs

Efficiency and lower cost in operating utility fleets are being gained through leasing of both general-use and special-purpose equipment and also through use of the "smaller" passenger car. Fleet leasing covers more than 15,000 units of mobile chattels operated by about 40 power companies in the US. In addition to passenger cars and conventional trucks, utilities are leasing construction equipment, portable generators, station wagons, and even aircraft.

Avoidance of capital investment and cost of money are prime reasons offered by utilities for leasing. The usual lease arrangement is known as "net leasing," in which the lessor provides the equipment, and the utility handles repairs, insurance, maintenance, etc.

Cleveland Electric Illuminating leases all passenger cars for one or two years, turning them in for new vehicles at model-change time. Central Maine Power also leases its auto and truck fleet. Georgia Power recently sold its fleet of cars, trucks, and low-bed trailers and is leasing them back. They report a slightly lower cost in favor of leasing. Another southern company finds it economical to rent, rather than own, large construction equipment, such as the backhoe digger. Philadelphia Electric leases to meet the peak demand for trucks to handle heavy hauling and construction work.

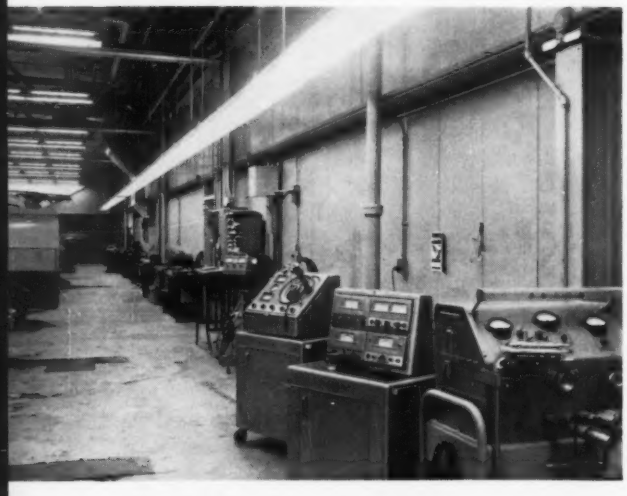
Two trends of note in passenger cars are the "smaller" car and station wagons. Potomac Electric Power bought two small cars and found their use so satisfactory for inspection work and meter reading that four more will be purchased. A small bus-type vehicle is used in messenger service among plants, substations, and buildings. Lower initial cost led a southeastern utility to buy 20 small cars, two of them for use by bill collectors.

Cleveland Electric Illuminating is considering use of the smaller car to meet congested traffic and parking conditions. CEI feels 10-25 small cars in a total fleet of 300 cars might be used. The company also has two 3-wheel covered scooters. Philadelphia Electric Co bought ten 100-in. wheelbase cars for economy and to alleviate the storage problem in its garage. One utility reports it gets 20 mpg—twice that for a standard-size car—for a smaller car used by a meter reader. One note of caution: It may be difficult to find fuel in rural areas for cars with Diesel engines.

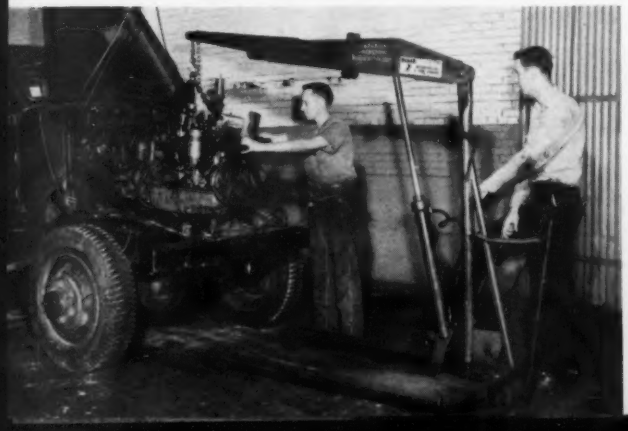
Policy on station wagons has been modified by Virginia Electric & Power. The utility buys the model with only one seat, one door on the driver's side, and two on the other. This model has heavier transmission, better brakes, and more storage space. It is used by relay and communication testers.

Another company has switched to station wagons for survey crews and field engineering parties, and uses sedan delivery types for relay and communications testers. One southeastern company uses the carry-all type of station wagon for survey crews because of its higher road clearance and greater load-carrying ability. An eastern utility uses station wagons to provide transportation for light line crews and essential repair equipment during storm emergencies.

IMPROVED LIGHTING puts 140 ft-c of light where instruments, close work and inspection are handled



TWO-TON CRANE finds use in pulling engines and for handling many other heavy objects in repair shop



Improve Maintenance Facilities

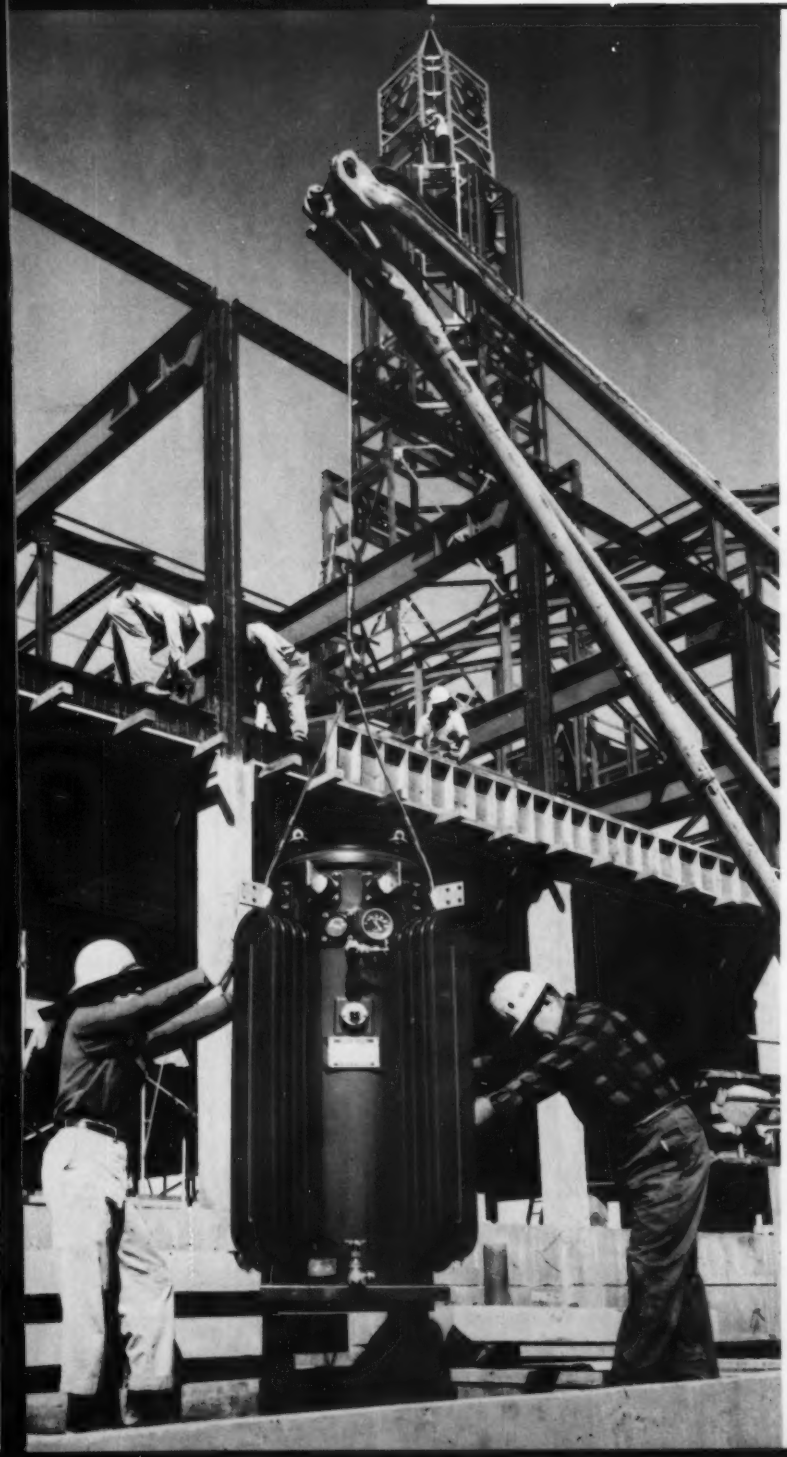
To better maintain its vehicular fleets, the industry is looking to improve its maintenance and repair facilities. Boston Edison relighted its general service garage with fluorescent fixtures to levels of 50 ft-c on floor areas and to 140 ft-c where close work, handling of instruments, and inspection are done. One company uses a new front-end alignment machine which projects readings for caster and camber and toe-in on a screen.

Other maintenance equipment used by utilities includes a chassis dynamometer to determine causes of trouble in the shop rather than on the road. Philadelphia Electric has a test bench for high-output generators designed for radio-equipped vehicles.

Working conditions will be improved through installation of electric resistance heating in the concrete floor and pits of one utility's automotive shop. Power lifts to raise fully-loaded trucks or cars are reported by a number of companies. An overhead washer used by one company to save time and labor consists of an automatic spray wash on a 26.5-ft track.

DISTRIBUTION

Equipment News



In this issue . . .

- **ADDED KVA CAPACITY**

  for substations with new "Powermaster" Transformer, illustrated at left. See page 2.

- **LOW COST SWITCHING**

  with new G-E gas loadbreak cutouts. See page 4.

- **FIVE-COAT SANDWICH FINISH**

  adds life to Vaultmaster network transformers. See page 6.

HELPFUL PUBLICATIONS

Distribution Transformers

10 Reasons Why General Electric Is Your Best Transformer Buy—GEA-6070C

Self-protected Distribution Transformers—GEA-6126B

Lightning Arresters and Cutouts

New Form 3K Station Arrester—GEA-6794

Secondary Lightning Arresters—GEA-2977E

Open Dropout Fuse Cutouts—GEA-1816L

Flip Open Fuse Cutouts—GEA-4224E

Enclosed Fuse Cutouts—GEA-6208

Any of these publications may be yours at no cost by writing the General Electric Co., Section 431-83, Schenectady 5, N. Y.

GENERAL ELECTRIC

COMPACT NEW SUBSTATION TRANSFORMER design cuts installation space 29% over previous units.

New G-E "Powermaster" Transformers

Give pad and platform substations added kva capacity

Cooperation between the Detroit Edison Company and General Electric pays off for you with a new substation transformer design; the smallest, lightest, most efficient substation transformer on the market.

Rapid load growth in highly congested areas presented a recurring problem to Detroit Edison engineers: how could they get additional capacity where it was difficult to get space for more transformers?

Cooperating with Detroit Edison, G-E engineers solved the problem with a completely new 250-kva lightweight transformer for pole mounting. This prototype paved the way for an entirely new line of substation transformers which are easier to install, require less room, and possess improved operating characteristics.

Significant reduction in size and weight and improved electrical characteristics stem from a newly designed interior and exterior. Formex* wire is now used exclusively for turn insulation. New panel radiators are only 8 inches wide.

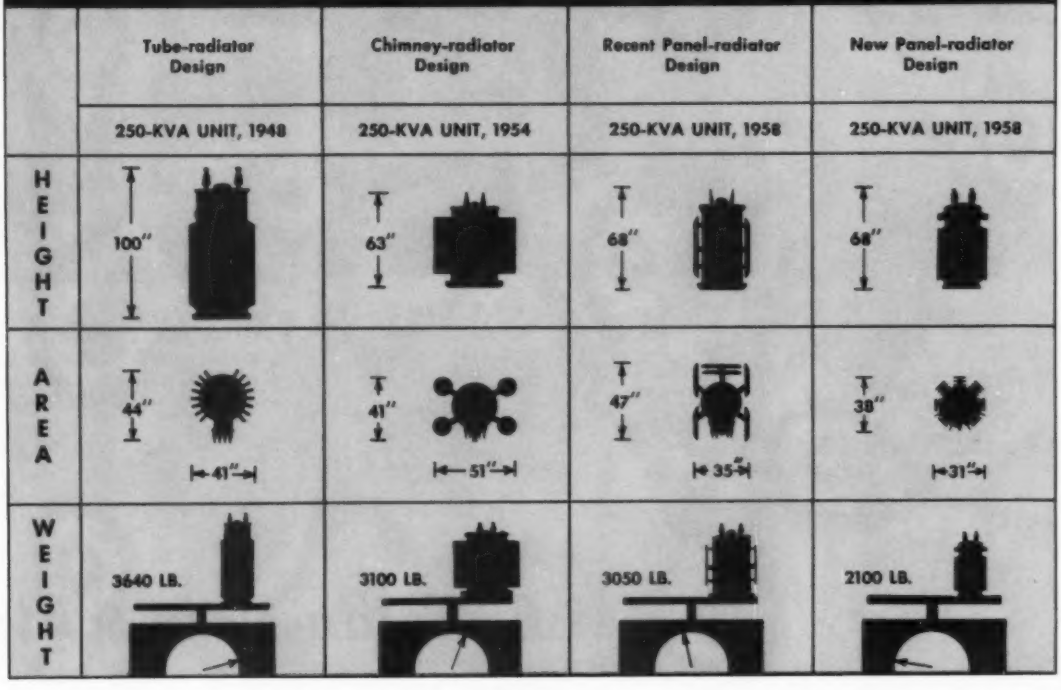
The pad-mounted substation units incorporate the same basic design improvements as the Detroit Edison pole-type units. In addition, they are fitted with tank base, externally operated tap changer, thermometer and liquid level gage. The new units conform to EEI-NEMA standards, and are available in ratings 500 kva and below, 15 kv and below.

*Registered Tradename of G.E. Company.

Progress Is Our Most Important Product

GENERAL ELECTRIC

10 YEARS OF SUBSTATION TRANSFORMER PROGRESS



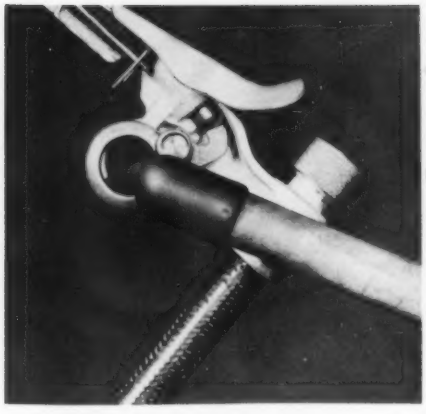
Detroit Edison and G-E engineers develop 250-kva pole-type transformer—paving way for new substation design

EDWARD G. ZIEGELER, Division Planning Engineer, Detroit Edison Company, reports on the 250-kva pole-mounted transformer whose features have been adapted for substation transformer use.

"The new 250-kva single-phase pole-type transformer helps us minimize congestion at transformer locations. Where lighting demand is in excess of 167 kva, we install one transformer, instead of two in parallel. In serving large secondary customers where the demand exceeds 500 kva we can install three 250-kva transformers. This eliminates the need for a second transformer cluster which is very often objectionable from a public relations standpoint, and usually difficult where space is at a premium."

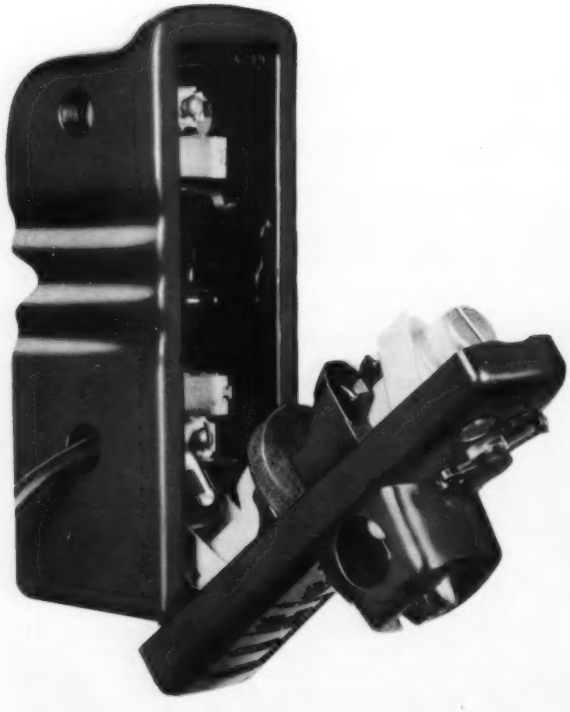
For complete information, contact your General Electric Sales Office, or write to General Electric Co., Section 431-83, Schenectady 5, N. Y.

MR. L. H. LANDRY, left, Electrical Apparatus Div. of Detroit Edison Company, and P. J. Robinson, General Electric Utility Sales, inspect first pole-mounted 250-kva unit delivered to Detroit Edison Company. New substation transformer design resulted from developmental work done on this pole-type unit.



1 **ALWAYS READY** and unaffected by weather conditions, a conventional switchstick is all that's required to "break load."

Full-load switching

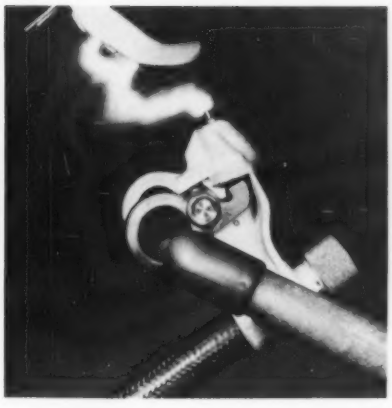


Revolutionary gas load-break on open and enclosed cutouts blows out arc automatically

Now you can open circuits under full-rated load safely and economically with General Electric's new gas-operated load break. The gas load-break feature, first incorporated and proved in service on the G-E 100-ampere enclosed cutout is now available on all 7.8 and 15 kv ratings of G.E.'s open dropout cutouts including the disconnect blade.

Open or enclosed, the General Electric gas-operated load break can provide dependable low cost switching service over the entire distribution system. In addition, the lineman has complete control of the load break operation making opening under full load safer, easier and quicker. Existing G-E open type cutouts now in service can be converted to provide low cost switching. The fuse tubes for incorporating the new gas-load break feature are interchangeable with all G-E open-type cutouts of modern design. As part of the complete line of open dropout units available, a mechanical load break is also offered. Be sure to get complete details from your General Electric Apparatus Sales Office or write for bulletins GEA-1816 (open dropout cutouts) or GEA-6208 (enclosed units).

GENERAL ELECTRIC

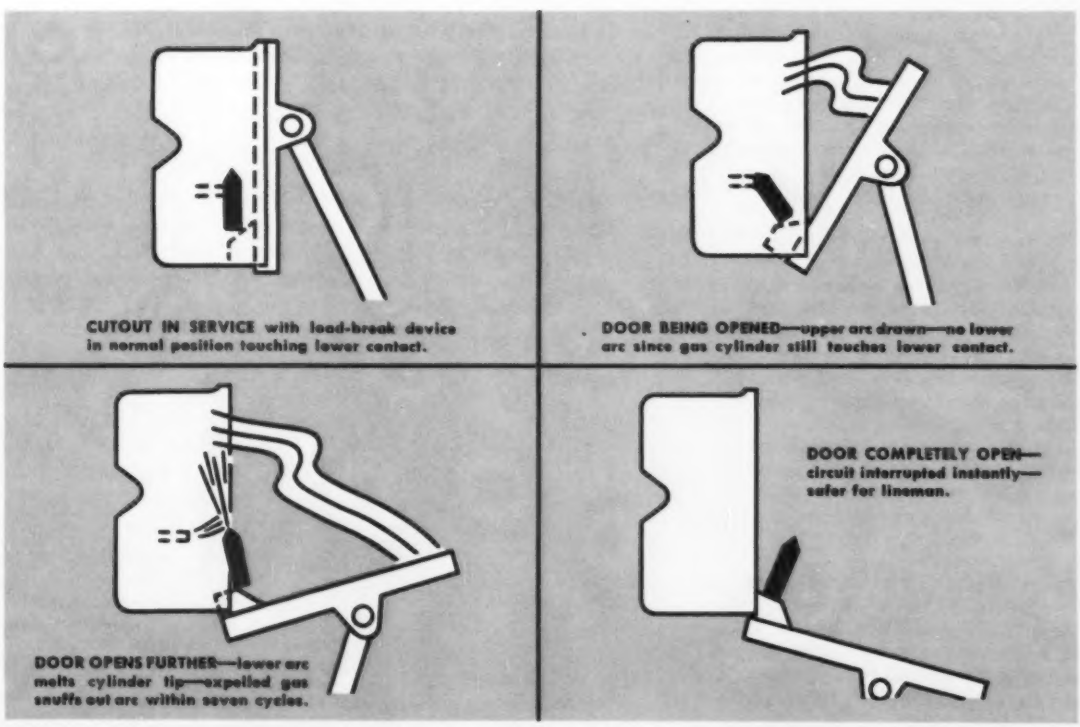


2 **ARC IS DRAWN** between top contact and tip of monel gas cylinder. Load break has no effect on normal cutout function.

3 **ARC MELTS TIP** of the monel gas cylinder releasing blast of insulating gas. This new device makes opening under full load safer and easier for your lineman.

4 **ARC IS OUT** within 2 cycles at full load. Circuit now open. Fuseholder can be removed; cylinder replaced in seconds.

with new G-E cutouts


CUTOUT IN SERVICE with load-break device in normal position touching lower contact.
DOOR BEING OPENED—upper arc drawn—no lower arc since gas cylinder still touches lower contact.
DOOR OPENS FURTHER—lower arc melts cylinder tip—expelled gas snuffs out arc within seven cycles.
DOOR COMPLETELY OPEN—circuit interrupted instantly—safer for lineman.

Implications of the New Network Finish

HAROLD BRUNTON, JR.
Manager—Network Transformer Sales

Paint is always a major concern on network transformers. When you put a unit in a vault that is periodically flooded or filled with contaminants washed off city streets, corrosion is an ever-present problem. Chemical snow removal practices aggravate the problem.

Faced with this situation, General Electric's first approach was to put some extra "gunk" on the bottom of the transformer. This part of the tank and radiators took the worst punishment. After considering plastic, rubber and tar materials, we decided on an asphalt-type "undercoat."

The application worked fine until we discovered that occasionally the "undercoat" would separate slightly from the transformer. Apparently this is an inherent problem of such "undercoats." And when it happens, the "undercoat" acts like a boot.

Water running down the side of the tank collects in the boot which, instead of protecting the tank, then aggravates the corrosion problem.

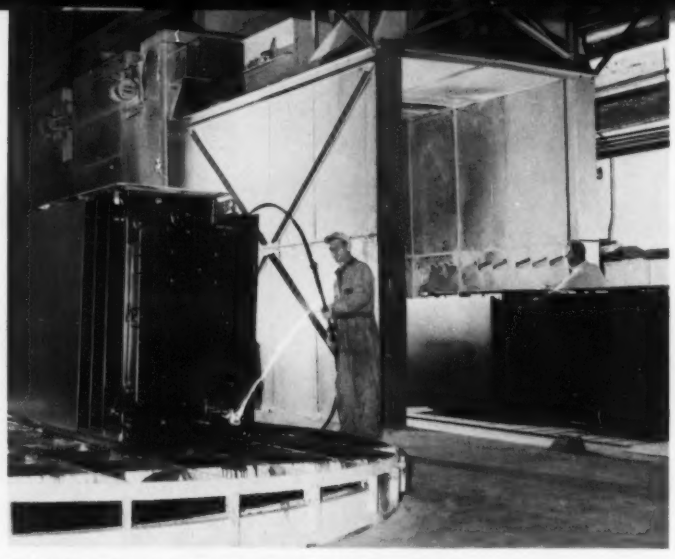
About this time, our laboratory came up with a new rubber-like paint called Melaprene which is applied to the tank surfaces. Results are almost unbelievable. In the "Weather-ometer" test, Melaprene lasts 6 times as long as our previous finish. In the standard ASTM accelerated salt-spray test,* Melaprene lasts more than 7000 hours compared to 1600 hours for the previous good finish.

We decided to apply this new paint as an extra protection on top of the previous finish. We painted the entire unit and used two coats instead of one. In 1957 we standardized the new paint system.

Subsequent experience revealed that Melaprene would discolor if left in sunlight. While the corrosion resistance was unimpaired, the appearance became unsightly with splotches of purple, yellow and brown. Our laboratory then developed a new Melaprene formulation which we "sandwich" between the base paint and an improved subway black, giving a finish which won't discolor in sunlight.

A few months ago, we started supplying transformers with the new paint finish. We believe that it is the best network transformer finish available today. Certainly we know it is far superior to anything G.E. has been able to offer. We believe it is a tangible ***extra value.***

*No. B-117-54T



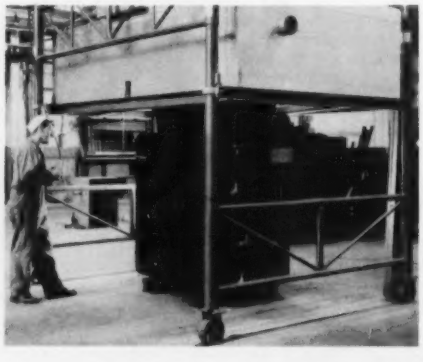
FLOW-PAINTING OF NETWORK TRANSFORMERS gives even coverage. The new conveyorized oven exactly controls the baking cycle.

New "Sandwich" Paint Process Applied To Network Transformers

The new G-E Vaultmaster network transformers are painted according to a new improved method. Instead of applying the finish coats directly over a base paint, the common practice, we sandwich Melaprene paint between the base and finish coats. This new six-step process gives longer finish life and improved resistance to sunlight.

Step 1—Carefully controlled grit/shot blast
Step 2—Base coat of red lead-chromate—Flowed-on and baked
Step 3—***Two coats Melaprene paint—flowed-on and baked***
Step 4—Two coats Subway Black paint—flowed-on and baked
Step 5—Complete finish on tank rim—same as Steps 2 through 4
Step 6—Touch-up—sprayed-on and air-dried.

As noted in Step 5, the superlative five-coat finish is applied on the tank rim to which the cover is welded. Rather than just use touch-up paint over the welded area, G.E. has built an adjustable infra-red oven which enables each coat of paint to be individually baked on.



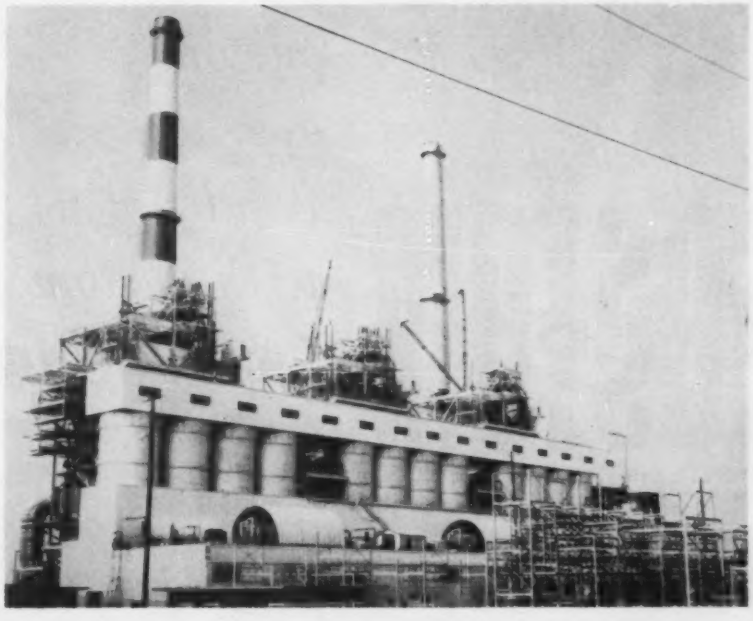
Adjustable Overhead Oven permits baking individual coats of paint on cover and tank rim after cover is welded to the tank.

GENERAL ELECTRIC

Aluminum Used Extensively at Warrick

Some 2,000,000 lb of aluminum will be used in the electrical system, structure, and equipment of the 375-Mw Warrick generating plant being built by the Aluminum Corporation of America. The power station, located in Evansville, Ind., will be constructed for a subsidiary, Alcoa Generating Corp. The station, with three 125-Mw turbine generators, will be operated by Southern Indiana Gas and Electric Co and will be connected to the utility by two 138-kv tie lines.

The generators will go into operation by the middle of 1959, when the initial smelting works potline is activated, producing up to 150,000 tons of primary aluminum annually. Provisions are made for 100% expansion in generating facilities.



Aluminum for electrical equipment includes application of the metal for: switchyard structure, isolated phase generator bus, station bus, output bus to smelter, towers, conductor, switchgear, conduit, panels, cable trays, and lighting fixtures. About 40% of aluminum used in the station will be on boilers, turbines, condensers, and feedwater heaters, and their auxiliary and structural components. The three condensers will have 165 miles of 1-in. heat exchanger tubing. Substantial quantities of aluminum tubes are used in the No. 1 and No. 2 low-pressure feedwater heaters of all three units.

Alcoa believes it can claim two "firsts": 1) in its application of aluminum for components of the turbine generators (lube oil coolers, gland exhauster, and hydrogen coolers) and 2) "boiler lagging" (aluminum used for the outer skin protecting the thermal insulation covering the steel inner-casing of the boilers). Initial installation of boiler lagging by Alcoa in 1953 is being repeated at the Warrick plant.

Turbine maintenance will be performed with the aid of an all-aluminum canopy, a Quonset-type structure composed of six sections. These canopies may be moved independently on rails running the entire length of the turbine deck.

Structural Applications. Largest single use of aluminum will be for the 84,000-sq ft of grating installed in the steam generator auxiliary areas and in the station proper. There will be 16,500 ft of aluminum handrails, 2600 stair treads, insulated ribbed industrial siding panels. The plant's ventilating and air conditioning systems, windows and doors, hardware, and fencing are aluminum.

The gate house and administration building will be sheathed in color-anodized ribbed siding.

GE Aphonic Enclosure, Other Transformer Developments

Five 70,000-kva, 138-69-kv power transformers having sound levels as low as pole-type distribution transformers were recently built by General Electric Co and installed in Consolidated Edison's Queensbridge substation, New York City.

The units are said to be the largest built to date with aphonic enclosure design, and averaged less than 50 decibels when tested in GE's Sound Laboratory in Pittsfield. This represents a reduction of 30 db from the 80-db noise level set by National Electrical Manufacturers Association's standards for transformers of this size.

Made of steel, the aphonic enclosure completely surrounds the transformer tank. Air space between tank and enclosure, plus padding of sound absorbent glass fiber batts, suppresses the hum. The transformer tank rests on resilient mounts to further reduce the transfer of sound.

The new station is scheduled to begin operation in the Spring of 1959. Consolidated Edison engineers specified that provision be made for adding more cooling equipment to the transformers in

(Continued on page 90)

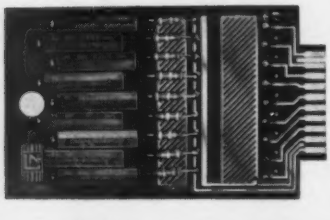
CUSTOM

get custom operating results with custom L&N generation controls

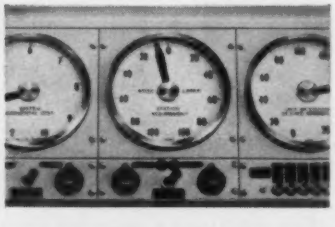
PROBLEM: How can a System Operator get an economic dispatch equipment arrangement that closely fits *his* particular system's operating requirements?

ANSWER: Look at *these* newly-developed control components by Leeds & Northrup, keeping in mind the outline of your own operating requirements. You'll find you can actually "design" a control arrangement that's "in phase" with those needs.

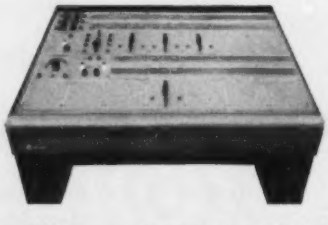
As a result, when you make the decision to move to more advanced control, you can do it with assurance that your control will accomplish the ultimate operating objectives: lowest cost at the coal pile, and trouble-free operation. Get the facts from an L&N Generation Control Specialist, or write to 4938 Stenton Ave, Philadelphia 44, Pa.



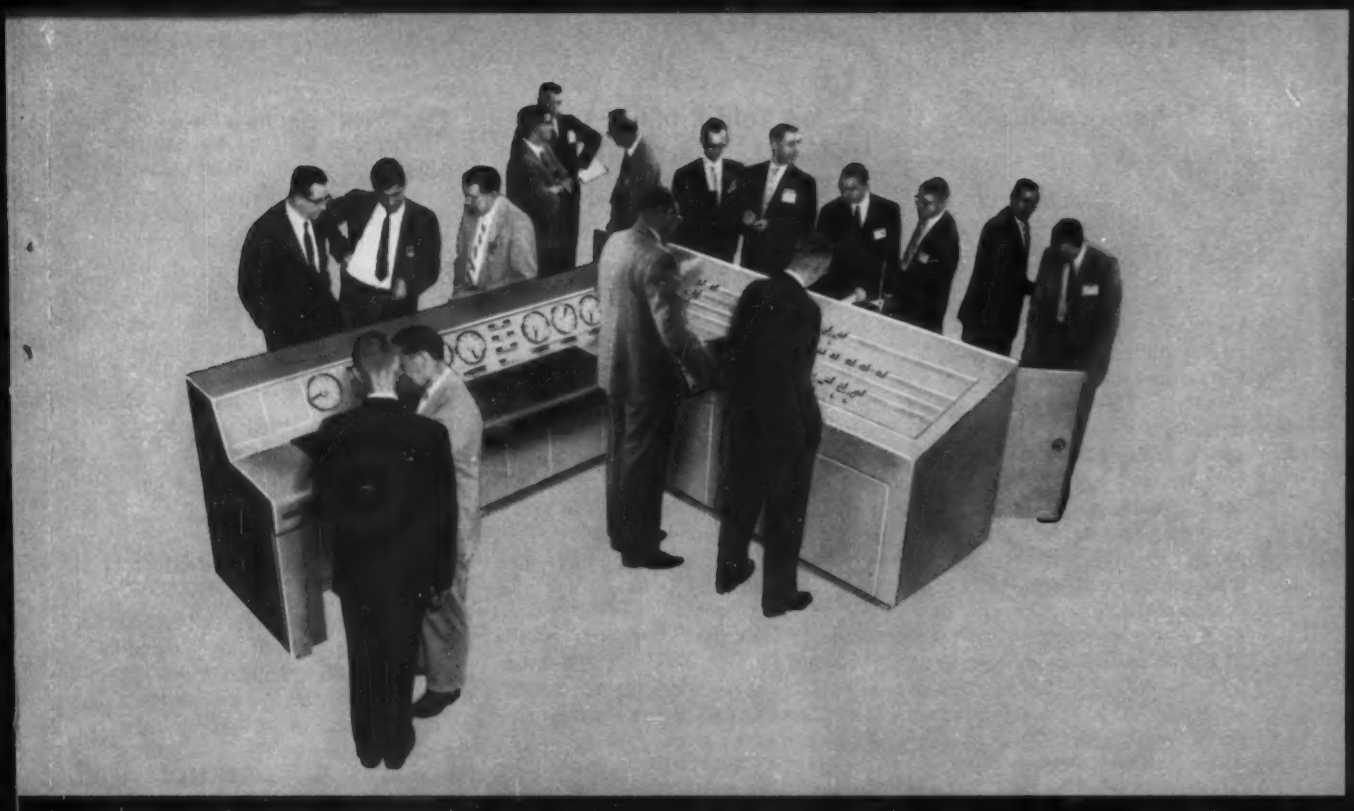
TRANSMISSION MATRIX: *For use with computer when required. Utilizes adjustable, printed circuit B-constant cards for compactness, low heat dissipation.*



READOUTS: *For use with computer, these indicate cost of power at interconnection points, cost of delivered power, required generation change at each station when total system generation is changed by a given amount, desired generation (units and stations), total system generation, total system load, total steam generation and other, similar system data.*



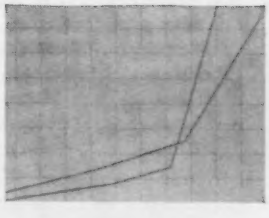
FLEXIBLE ECONOMY LOADING CONSOLE: *Used with or without computer, this console enables the Dispatcher to automatically load the system using precalculated loading schedules. When used with computer, the console serves to provide automatic loading during those periods of the day when adherence to a strict economy loading schedule is not feasible. It can also be used when the computer is off control during load studies, outages, etc.*



DUAL-FUNCTION *"desired generation"* **COMPUTER:** Dynamic analog device works both as control unit and independent load-study computer. Evaluates prevailing, rather than inferential, system data; makes lowest cost allocation of generation changes giving each unit a terminal destination. Utilizes transistorized function generators with adjustable intercepts and slopes. Can be equipped with a variety of readouts, setters, a transmission matrix and X-Y plotter. Accommodates any required number of sources.

HIGH SPEED, CONTINUOUS TYPE TELEMETERING: *Utilizes fast-response Thermal Converters and precision Speedomax G recorders to feed any desired system data to the dispatching center and generating stations. Can be used with or without transmitting-end recorder on microwave, carrier, or leased line channels. Quantities which can be telemetered include kw, rkva, kva, volts, weather data and a wide range of system information utilized by dispatching personnel.*

DUAL-RANGE FREQUENCY RECORDER: *±½-cycle and ±10-cycle ranges on the same wide strip chart. Normal operation is on the narrow range. Recorder automatically switches to wide range when frequency exceeds half-cycle limits.*



X-Y PLOTTER: *Used with computer to graphically record solutions to load study problems. Can be mounted integral with computer console or on a separate, movable table.*

LEEDS & NORTHRUP
Instruments Automatic Controls • Furnaces

GE Aphonic Enclosure

(*Continued from page* 87)

the future, so that each can be uprated to 116,667 kva.

Other transformer developments are . . .

. . . shipped a 375 Mva 17.1/138-kv transformer, a 275 ton unit, the largest built at Pittsfield, Mass., to Commonwealth Edison Co, Chicago, Ill. This Joliet-plant unit reportedly weighs less than 1.5 lb per kva capacity. The coolers have a heat transfer capacity almost twice that of conventional cooling units, according to GE.

. . . built two, 3-phase, open dry-type transformers with three-legged core construction. The new unit is 12% lower in height, 60% smaller in length and 13% in width than a former unit of the same size, according to T. F. Volkmer, manager of engineering, Medium Transformer Dept. Both units, a 5,000/6,667-kva unit for Dairyland Power Coop, Lacrosse, Wis., and a 7,500/10,000-kva unit for Potomac Electric Power Co, Washington, D. C., have 15-kv-class high voltage and 5-kv-class low voltage.

Kennecott Copper Plans Acquisition of Okonite Co

Kennecott Copper Corp will acquire the properties, assets, business, and good will of The Okonite Co, Passaic, N. J., in exchange for Kennecott common stock on a share-for-share basis. By a signed contract, acquisition will be made through a Kennecott subsidiary, according to Charles R. Cox, Kennecott president, and R. Stuart Keefer, Okonite president.

The proposal is to be submitted to Okonite stockholders at a special meeting November 24, and if approved would take effect immediately.

While the present Okonite company will be dissolved, a new company with the same name will be formed to operate as a subsidiary, the executives announced.

Kennecott reportedly plans to continue the fundamental Okonite policies, and to accomplish this the employment contracts of Okonite's principal officers will be taken over to assure the continuance of their services.

CEMA Told Profit Is 3.2%, Other Markets Studied

Profit margin of the past five years in the Canadian electrical manufacturing industry has averaged only 3.2%, stated T. J. Bell, retiring president of Canadian Electrical Manufacturers Association, at the recent 14th annual meeting of the Association.

Bell mentioned two major odds for the manufacturers: "Pressure from foreign-dominated labor unions to bring Canadian wages into line with those paid in the United States"; and competition from goods imported from foreign countries for sale in Canada.

"Figures from last year," Bell said, "show that imported goods accounted for 27% of the total market for electrical manufacturers in Canada, and in some fields, the figure rose as high as 40%."

New markets, such as steam stations and nuclear plants, are under constant review, Bell told a press group. Three manufacturing companies are prepared to build steam turbine generators up to the largest rating, when special machines, tool equipment and blading shops are added. Two companies have established Atomic Divisions with staffs of skilled nuclear engineers. Both groups are working on special reactor designs which they feel are most suitable for Canadian application, Bell said.

Babcock & Wilcox Builds Boiler For Iowa Electric

Babcok & Wilcox Co has received a contract totaling more than $3-million for the manufacture and installation of steam-generating equipment at Iowa Electric Light and Power Co's Sutherland Station, Marshalltown, Iowa.

The boiler, to serve a 82,500-kw turbine-generator, will be fired by three 8-ft-diam Cyclone furnaces, burning, at maximum capacity, 42½ tons of Iowa coal. B&W officials say this is the first time that Iowa coal has been used in Cyclone furnaces, and point out that the fuel is low in heat value and high in moisture ash and sulphur. In this type furnace it can be used with 88% efficiency.

In addition to burning Iowa coal, the boiler can be fired by natural gas piped in from Oklahoma and Texas. The gas will have a heat value of 1000 Btu.

Designed for a pressure of 1775 psi, the boiler will operate at 1500 psi, and 1005/1005F. It will be capable of generating a maximum continuous steam flow of 575,000 lb per hr.

The new boiler is scheduled to go into operation in 1961. Sutherland's present capacity is 66,000 kw.

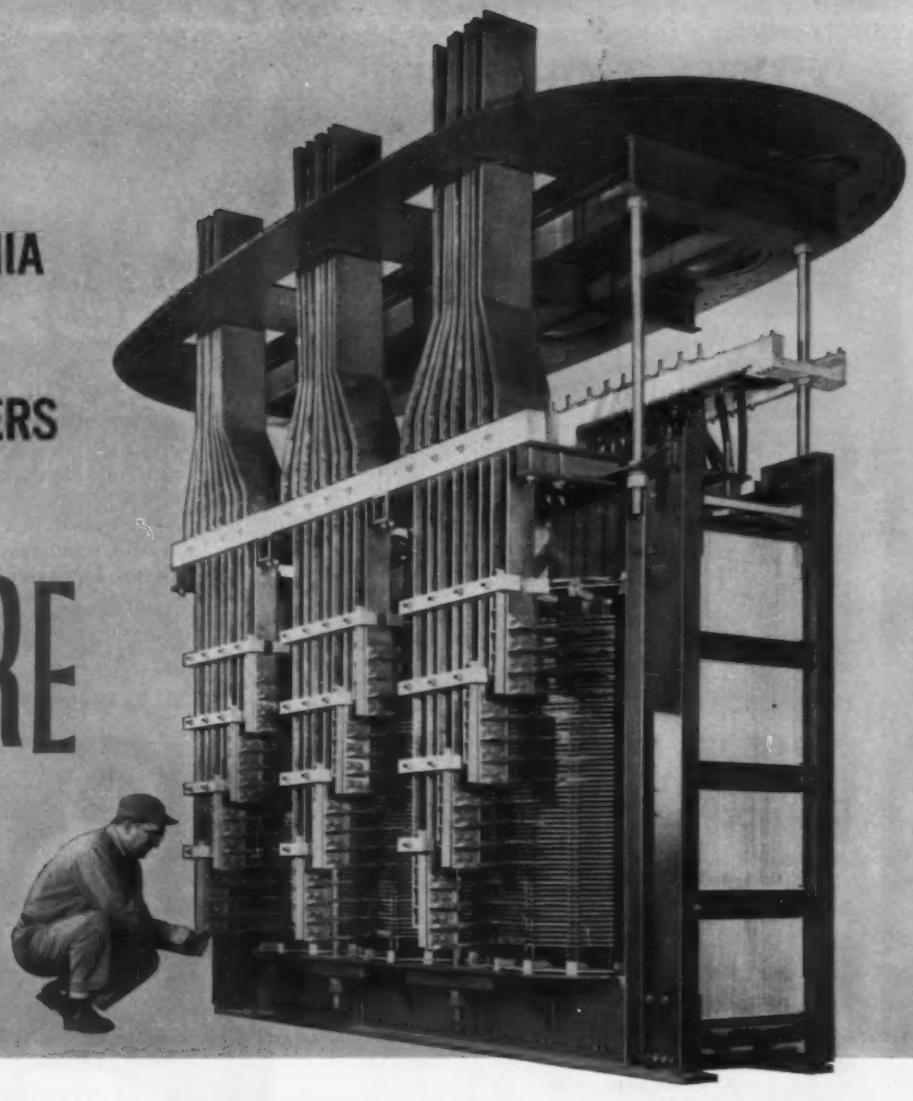
MANUFACTURERS BRIEFS

Kaiser Aluminum & Chemical Corp., Oakland, Calif., has manufactured a multi-conductor cable believed to be the first aluminum conductor used in an underground fire alarm system. The 15-conductor cable, size No. 12 AWG, Laytex insulated and neoprene jacketed, was pulled in a continuous length through a 700-ft duct line in the Newark, N. J., business district.

Foxboro Co, Foxboro, Mass., offers a series of solid state electronic control instruments. Called Electronics Consotrol Instrumentation, it consists of transmitters, recorders, controllers, and valve operators. Typical process measurements such as pressure, flow, and level, are converted at the transmitters to proportional current signals and instantaneously transmitted over unshielded lines to a control center.

Allis-Chalmers Mfg. Co, Milwaukee, Wis., research scientists have developed a gaseous, 24-volt fuel cell which instantly converts chemical energy to electric energy by means of electrodes and an electrolyte, without intermediate conversion to heat energy. Such direct conversion gives the fuel cell possible efficiency of 90%, according to A-C, whereas present efficiency of the best heat-cycle engines is about 40%. One possible use, suggested by the company, is for utilities to use off-peak generating facilities to produce hydrogen and oxygen. Power companies could store and transfer the gases for use anywhere a fuel cell arrangement was established.

How PENNSYLVANIA FURNACE TRANSFORMERS take the TORTURE of Year-in, Year-out Service



Furnace transformers are subjected to repeated short circuits and heavy overloads in ordinary service. Distribution of currents and reduction of copper eddy losses also must be given special consideration.

Throughout the years, Pennsylvania Transformer has earned an unsurpassed reputation for meeting these challenges—in installations ranging from 250 through 25,000 kva, and from 3175 through 82,000 amperes. Here are some of the reasons.

Balanced, Precompressed Coils

Coils are balanced to reduce axial short-circuit forces to a minimum . . . and the circular shape protects the coils against deformation by radial short-circuit forces. Also, coils are precompressed with a pressure equal to the maximum short-circuit force that might occur in service. As a result, no additional distortion or displacement can take place.

Bracing of Coils, Bus Bars

Coils are firmly braced, top and bottom, by clamping plates attached to structural steel frames. The accompanying photograph also shows the sturdy supports used for low voltage bus bars. Interleaving of bus bars tends to counterbalance the lines of force and prevent distortion during short circuits.

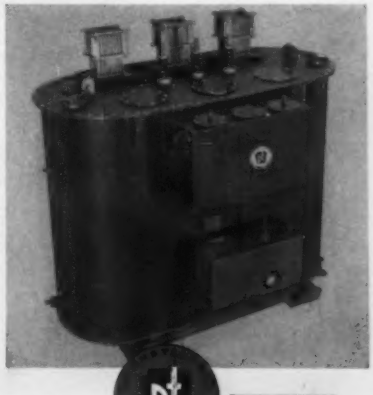
Distribution of Current

Because of the heavy secondary currents, the winding is subdivided into numerous parallel sections. Transposition of the individual conductors of each section reduces copper eddy losses to a minimum. This results in improved efficiency, more uniform copper temperature, and prevention of hot spots.

To take advantage of these and other time-proved features of Pennsylvania Furnace Transformers . . . contact Pennsylvania Transformer Division, McGraw-Edison Company, Box 330, Canonsburg, Pa.

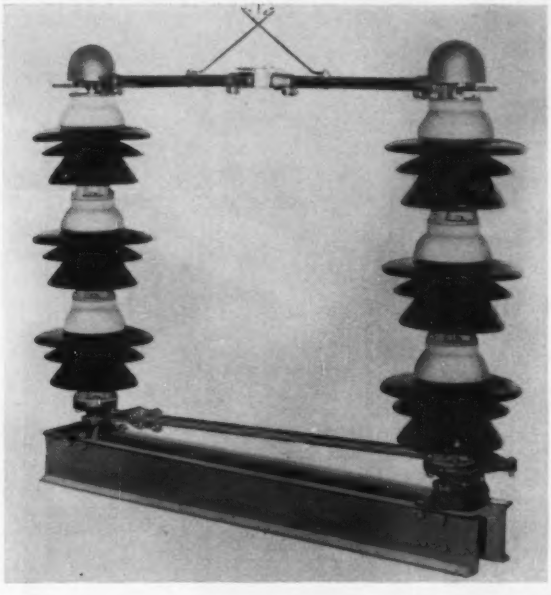
NEW EXTERNALLY-MOUNTED TAP CHANGER

Although a duplicate of a previous order, this 12,000-kva Pennsylvania Furnace Transformer differs from its "twin" in one detail. Its motor-driven tap changer is housed in separate compartments, to facilitate periodic inspection and maintenance. The mechanism includes a provision for emergency hand operation.



PENNSYLVANIA FURNACE TRANSFORMERS

pt McGRAW EDISON

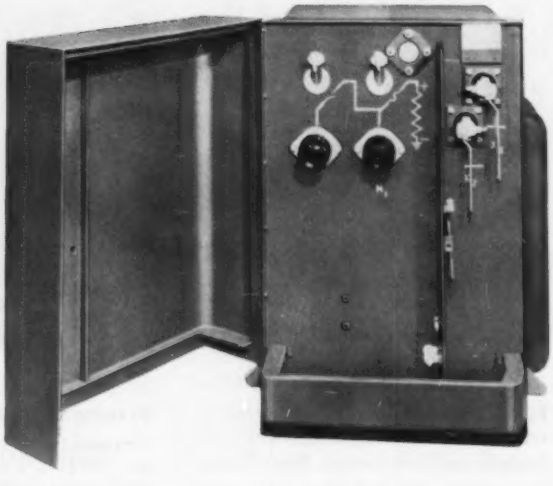


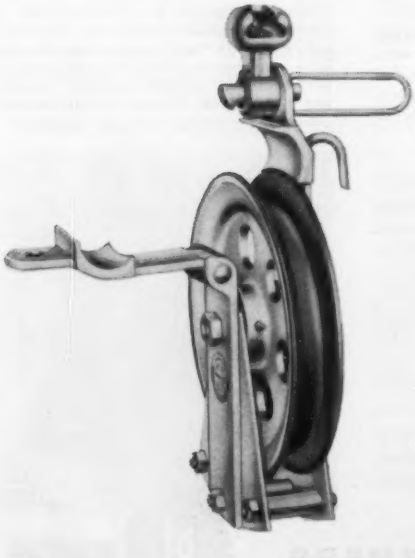
Center Side Break Switch . . .

. . . is available in voltage ratings of 34.5 kv to 161 kv and continuous current ratings of 600 and 1,200 amp. Known as Type WT, the switch can be used on lines or at substations for isolating, bypassing, or sectionalizing service. Silver-to-silver Amplitact contacts provide maximum dependability by taking advantage of the electro-magnetic forces created when the switch is subjected to a fault current. It conforms to NEMA, AIEE, and ASA standards.
Southern States Equipment Corp, Hampton, Ga.

Distribution Transformer . . .

. . . is designed specifically for underground residential and commercial service. Live parts are enclosed in a locked compartment, and access to fuses, bushings, and disconnects is gained by opening a hinged door on the compartment. Single-phase units up to 100 kva and 3-phase units up to 300 kva are available for distribution voltages up to 14.4 kv. Units are completely self-contained.
RT&E Corp, Waukesha, Wisc.





Stringing Sheave . . .

. . . has permanently bonded neoprene liner. Type GNA neoprene is bonded to the aluminum alloy sheave by a vulcanizing process, producing a smooth, resilient liner which protects aluminum conductor and resists wire rope abrasion. It also offers resistance to lubricants and to extreme weather conditions. It is available on all stringing blocks sizes 7 in. through 28 in.
Sherman and Reilly, Inc, 100 W First St, Chattanooga, Tenn.

(More New Equipment on page 96)

...EVEN HOT...

"One Piece" FARGO CONNECTORS ARE EASY TO INSTALL

NEOPRENE GROMMETS HOLD SPACER IN POSITION FOR EASE OF INSTALLATION

For hot work Fargo's "9000 Series" aluminum bodied vise type connectors are available with soft flexible grommets which hold the spacer bar in an open position so the run and tap conductors may be installed with ease. The grommets are out of the current paths between the conductors and do not interfere with the smooth easy operation of the clamp.

It is the easiest spacer bar clamp to install because it is "one piece" . . . no extra parts to assemble or threads to engage. Both hands are free to operate the hot stick.

Tool #72 courtesy of Safety Live Line Tool Company, Oakland, California. Others are available.

FARGO'S "9000 SERIES" FOR MAXIMUM PERFORMANCE IN SERVICE

Fargo's aluminum-bodied connectors have extra wide contact areas to overcome the high resistance of surface oxides and minimize cold flow. Larger mass gives additional radiating surfaces to hold the connector temperature under that of the conductors even under high fault currents. Well rounded corners and parabolic jaws minimize conductor damage due to physical distortion or nicking.

The soft pure aluminum spacer bar forms around the conductor excluding moisture and is a low resistance path between conductors . . . wide separation of the conductors minimizes the possibility of an electrolyte bridging the gap between the dissimilar metals.

The natural resilience of the connector body plus Fargo's exclusive vibration proof design maintains more than adequate pressure after repeated cycling. Fargo "9000 Series" connectors are available up to 397,500 ACSR.

Ask your Line Material Field Engineer for complete details.

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

Poughkeepsie, N.Y.

Distributed by

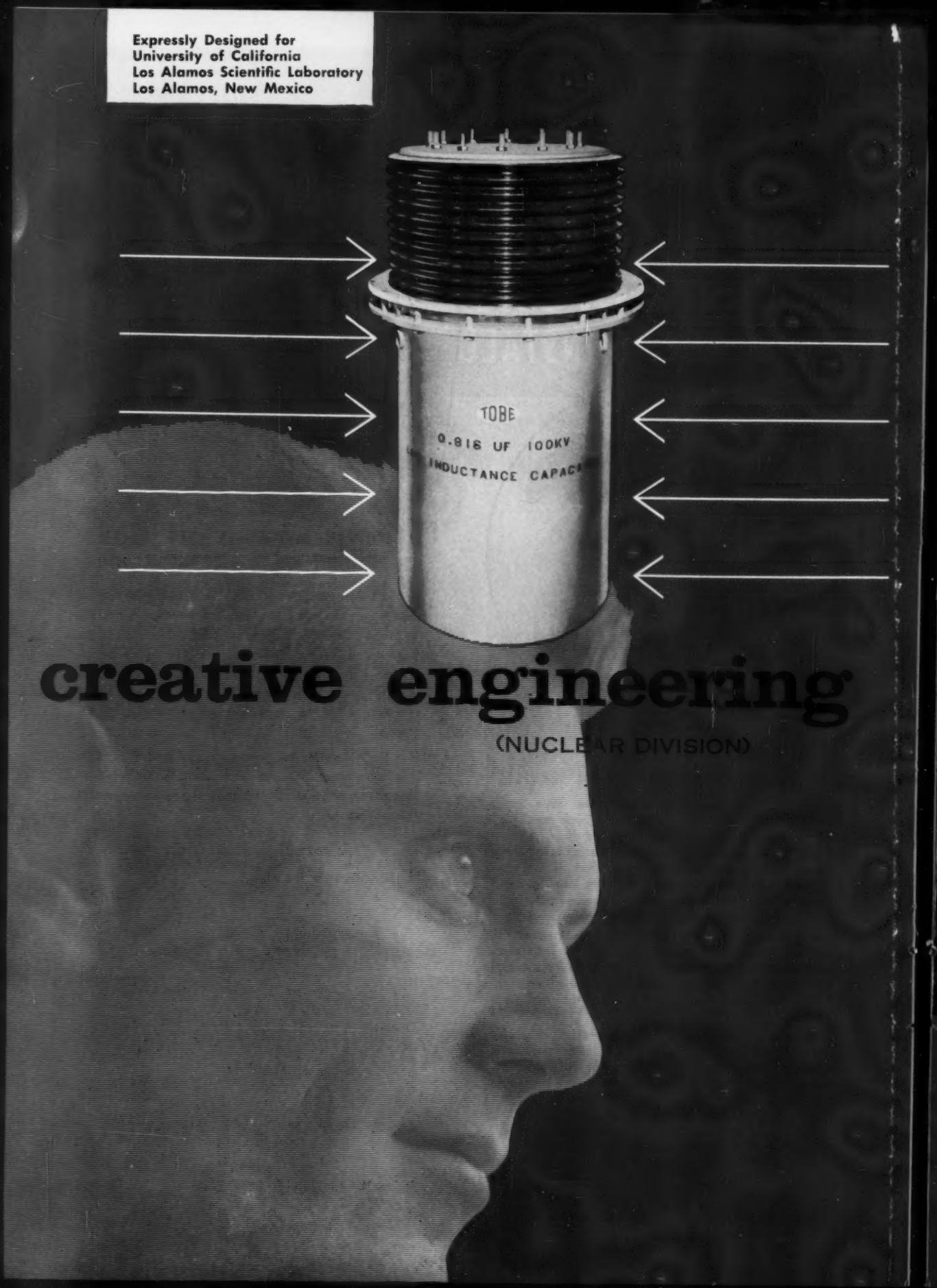
LINE MATERIAL INDUSTRIES

McGraw-Edison Company

Milwaukee, Wisconsin

LM®

Expressly Designed for
University of California
Los Alamos Scientific Laboratory
Los Alamos, New Mexico



creative engineering

(NUCLEAR DIVISION)

Tobe NRG-200 Series Energy-Storage Capacitor

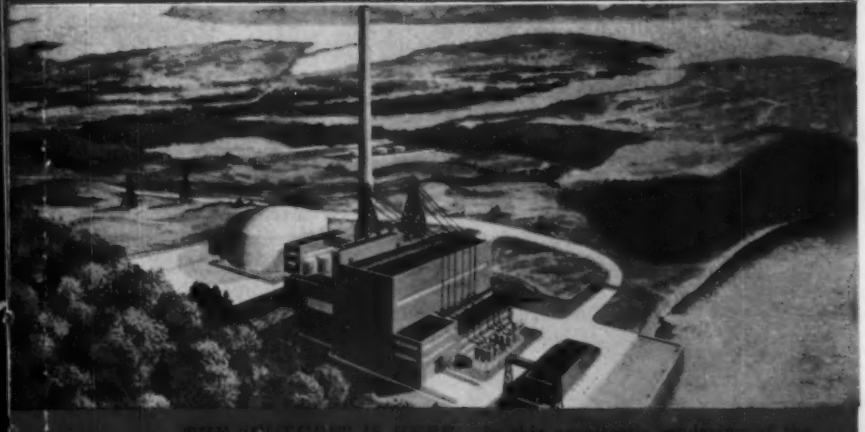
BUILDING CAPACITORS that can develop a peak surge of 20,000 megawatts takes intimate knowledge of capacitor physics and capacitor manufacture. Security regulations prevent our detailing the many projects in which Tobe is pioneering in the exacting area of thermonuclear energy-storage capacitors. (Utility research engineers are now investigating the thermonuclear "pinch" technique as a possible source for continuous electric power.)

Tobe 50 KVAR Power Capacitor

It was Tobe's long experience in building power capacitors that made it possible for us to develop capacitors capable of handling unprecedented peak loads. So, whether you need a bank of 50 KVAR's—or a bank of thermonuclear energy storage capacitors—talk to Tobe.

Tobe Deutschmann Corporation, Norwood, Massachusetts.

in action



THE "FUTURE" IS HERE...in this architect's rendering of the Indian Point, N. Y. nuclear power plant now being erected on the Hudson River 40 miles north of New York, by Consolidated Edison.

TOBE TEMPALL CAPACITORS

Since 1903 persistent research, tireless engineering, rigid production standards.

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For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

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RT&E .....Transformer ☐
Sherman & Reilly.....Sheave ☐
Clamps, Inc.....Guy Clamp ☐
Powerline Support.....Bracket ☐
GE .....Panel Meters ☐
Revere .....Control ☐

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OCTOBER 27, 1958

Cat. #652001

New Porcelain Products Pipe Mounting Wireholders

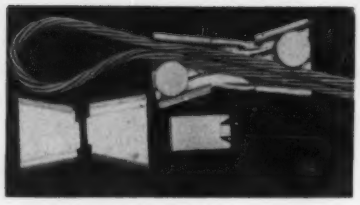
Porcelain Products *now* offers the finest universal pipe mounting wireholder available today. . . .

and here's why:

- Fits any 1¼" to 2½" pipe—ONE ITEM TO STOCK.
- Copper-bail reinforced insulator is stronger, with *extra* large wire holes—exceeds E.E.I. wireholder specifications.
- No loose parts—ready to install as is, on any size pipe.
- Bolts swedged rigidly to bracket for easy handling, installation.
- Slotted back bar permits installation without removing nuts.
- All steel parts are heavy gauge, hot-dip galvanized before assembly.
- Neat; trim, and compact for attractive installation.

Write for complete details

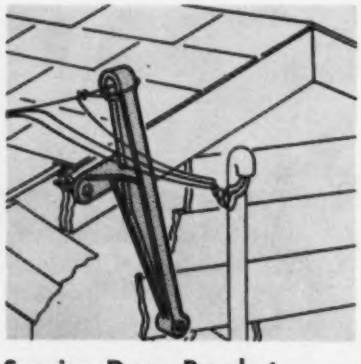
64 years PP INC. Porcelain Products, Inc. CAREY, OHIO



Guy Wire Clamp . . .

. . . requires no nuts, bolts, or maintenance; reduces labor, and has a high holding strength. The French Self-Locking Clamp has four parts: a housing equipped with two adjustable steel rollers which lock the wire by friction, two clips that slide over the main body of the housing, and rollers and a safety bar that slides between the clips to lock them permanently. The clamp weighs 1.2 lb and handles a variety of guy wire sizes. It is also practical for rope.

Clamps, Inc, 5th Ave and East 10th St, Oakland, Cal.



Service Drop Bracket . . .

. . . allows a 360-deg approach for triplex cable services. The support bracket eliminates the need for holes through the roof required by service mast installations. Cast of a durable noncorrosive aluminum alloy, the support is manufactured in a variety of sizes.

Powerline Support Co, Box 227, Fairborn, Ohio.

Panel Meters . . .

. . . resistance thermometer and proportional-position controller—have been added to the millivoltmeter-controller line. Features of the HP-40 resistance thermometer include automatic continuous standardization and elimination of the dry-cell

(*Continued on page* 98)

TWO IMPORTANT NEW FACTS ABOUT KAISER ALUMINUM AAAC

1. AAAC now available on an unlimited basis!

In the three years since Kaiser Aluminum first introduced AAAC, this revolutionary new all aluminum alloy conductor has been offered on a limited basis so that we could keep accurate records of its performance.

During this time, over two million pounds of Kaiser Aluminum AAAC—installed in widely varying locations—have been thoroughly tested and job proved. Results of these 3-year tests prove conclusively that AAAC offers remarkable new advantages in performance, economy and corrosion resistance.

These results have *far exceeded* our most optimistic expectations and we are now ready to offer AAAC for unlimited general use.

2. AAAC accessories now available from leading accessories manufacturers!

Leading manufacturers of armor rods, automatic splices and compression joints have recently established a full range of availabilities for these accessories. You'll find them listed and priced in published catalogs.

Many of these accessories have been tested on the same installations used by Kaiser Aluminum for proving AAAC. These tests have resulted in simplified installation techniques for miles of installed lines.

Your present KW distributor is a dependable source of top quality AAAC accessories.

KAISER ALUMINUM

IF IT CARRIES CURRENT, K/W CARRIES IT!

SEND FOR FREE AAAC BOOKLET

Yours for the asking...all the facts about new Kaiser Aluminum AAAC, complete with engineering data and ordering information, wrapped up in a concise, informative booklet. Get your copy now by mailing in the handy coupon below.

PLEASE SEND YOUR FREE BOOKLET CONTAINING FULL DETAILS ABOUT AAAC

Kaiser Aluminum & Chemical Sales, Inc.
Dept. 952
919 N. Michigan Avenue, Chicago 11, Ill.

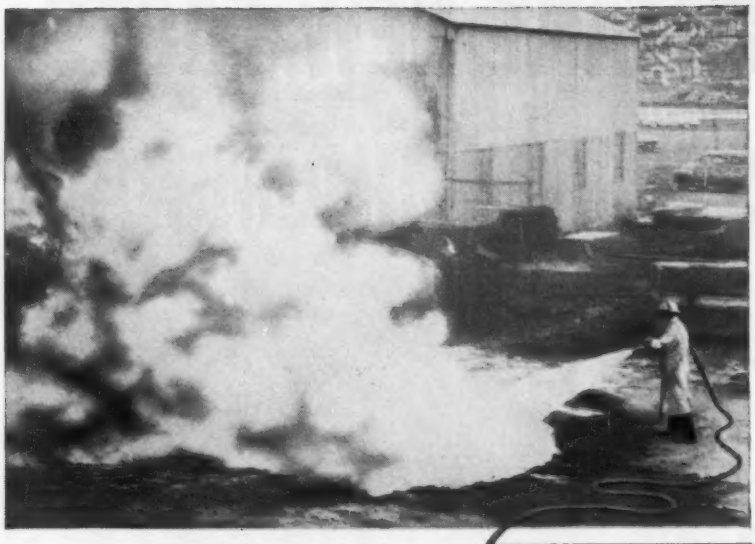
Please send your free booklet containing full details about AAAC.

Name_____

Address_____

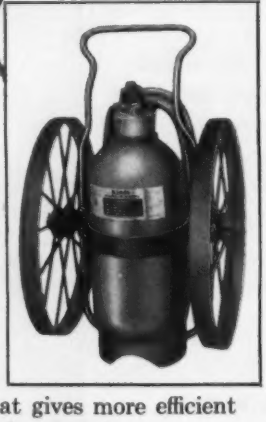
City_____ State_____

E. W.



NEW!

One-Man Dry Chemical Kills More Fire Faster!



This new Kidde pressurized 200-pound extinguisher gets *more* fire-smothering dry chemical on a blaze *faster!* Its universal nozzle discharges a dense 40-foot stream that gives more efficient extinguishing action, greater heat protection for operator.

It has an *extra* 50 pounds of dry chemical to discharge on any stubborn blaze. Not 150 pounds, but a full 200 pounds of dry chemical – a 33⅓% bonus for safety! Yet its total weight is less – no heavy, cumbersome gas cylinder.

It's faster to operate too. No valves to unscrew. No wait for pressurization, for dry chemical to fluff. No pressure reducer to malfunction. Just remove safety pin, swing valve toggle, and flip "on-off" nozzle lever. There's no hose whip either.

Only Kidde has the Bridgeman seal head assembly. When pressurized at 450 psi with nitrogen or *dry* air, an inner force of three tons acts on the seal – the more pressure, the tighter seal. Virtually leak-proof, tamper-proof.

Check these other benefits. A low, balanced center of gravity, wider handle, compact design, and larger, lubricated wheels make it easy to move. It's weather and corrosion protected. And the shielded dust-and moisture-proof pressure gauge tells at a glance this extinguisher's readiness for action.

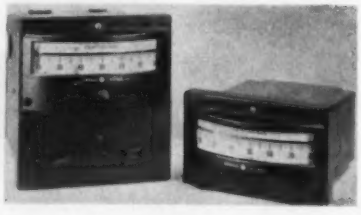
Write Kidde today and get the full story on this new U.L.-approved One Man Fire Engine.

Kidde (K Kidde)

Walter Kidde & Company, Inc.
1030 Main St., Belleville 9, N. J.
Walter Kidde & Company of Canada Ltd.
Montreal—Toronto—Vancouver

Panel Meters . . .

(Continued from page 96)



battery. It operates on 120/240-v ac, using 15 w. The HP-40 utilizes a silicon diode reference voltage supply for the d-c measurement bridge. Applications include temperature measurement of coil windings and bearings in rotating machinery, air conditioning, and refrigeration processes. The type HP-37 proportional-position controller provides throttling control of valves, dampers, and rheostats. It has an operating range from 0 to 140 F, and accuracy to within ±0.5%. **General Electric Co, Schenectady 5, N. Y.**

Photoelectric Control . . .

. . . can now be plugged into "Star-Lux" and "Urban-Lite" luminaires. They are wired to accommodate light sensitive controls of standard manufacture having 3-wire polarized locking plugs. The 2100-P photoelectric control, which fits both units, is factory adjusted to turn on 1.0 fc and off at 2.0 to 3.0 fc. It has a screw adjustment in the range from 0.5 to 6.0 fc and a time delay circuit to prevent false operation. **Revere Electric Manufacturing Co, 7420 Lehigh Ave, Chicago 48, Ill.**

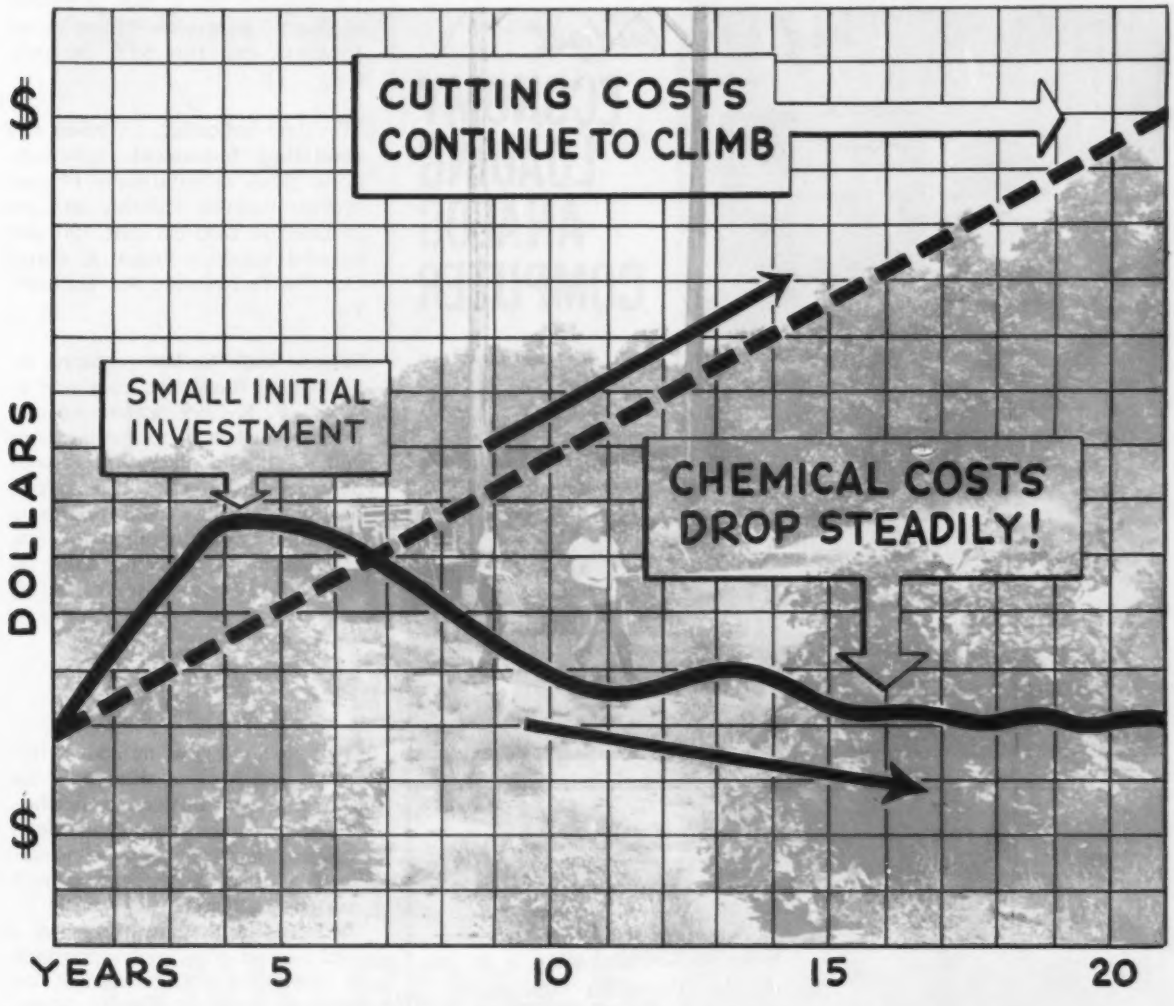
More New Products

Split bus panel for homes with electric heating provides 200-amp main lug service. This Stab-lok unit has four 2-pole circuits and 20 additional circuits available behind a 100-amp, 2-pole main breaker.—Federal Pacific Electric Co, 50 Paris St, Newark 1, N. J.

Lift block contains **insulator link** to protect riggers against electrocution from accidental contact of crane booms with energized lines. Available in capacities up to 35 tons,

(Continued on page 100)

CHEMICAL BRUSH CONTROL CUTS COSTS!



REPETITIVE MANUAL BRUSH CUTTING means constantly *increasing* costs because every year the brush gets heavier and labor costs continue to climb.

CHEMICAL BRUSH CONTROL, however, can produce a *descending* cost curve, as indicated in the chart. After an initial application with experienced crews using proven formulations, and specialized equipment under dependable supervision, an ideal right-of-way can be maintained by occasional low-cost "spot" spraying.

An Asplundh program of chemical brush control can assure a right-of-way that is readily accessible, with desirable conditions for wildlife, complete acceptance by the public and good erosion control.

Our fourteen years of experience and research in chemical brush control, plus nation-wide service, complete insurance protection and superior public relations, have made us leaders in chemical right-of-way work. We'll welcome an opportunity to discuss your problems in detail.

CHEMICAL DEPARTMENT

ASPLUNDH TREE EXPERT CO.
Jenkintown, Pa. and principal cities

Tailored to your system*....

and your budget

ECONOMY LOADING ANALOG COMPUTER

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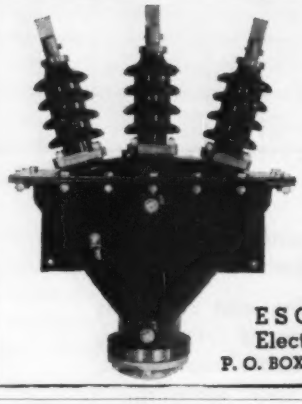

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(Continued from page 98)

the insulator link affords protection against 50-kv levels.—Miller Swivel Products, Inc, Box 938, Pomona, Cal.

Miniature **indicating, recording and controlling instruments** have optional plastic or metal doors. Plastics provide superior visibility and are gasketed to keep out dust, dirt and harmful vapors.—Fisher & Porter Co, 756 Jacksonville Rd, Hatboro, Pa.

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Atom Lead Held

(*Continued from page* 64)

the polls also show, he added, that even in 1957 less than half the women favored business ownership.

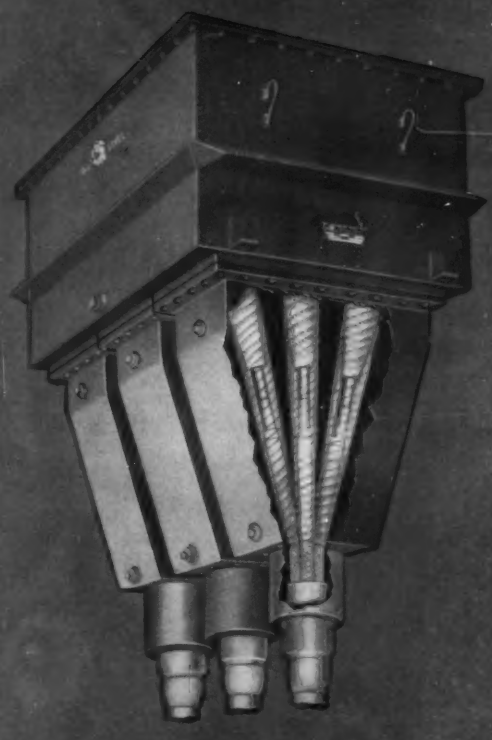
The power business, Van Meter asserted, is "frighteningly masculine," so that to reach women it must use a feminine approach.

Electric utilities must organize a hard core of grass roots opposition to government encroachment on business, declared Harold Mann, president, Iowa Southern Utilities Co. Congress, he noted, is increasingly favoring the philosophy of public ownership.

The tax relief afforded REA cooperatives is fine, said Southerland Dows, president, Iowa Electric Light & Power Co. Privately owned electric utilities, he said, should strive to obtain the same consideration for themselves.

J. E. Corette, president, Edison Electric Institute, urged business to work out an extensive program of economic education, informing people of the benefits of our type of government, and of the dangers of government ownership, control, and deficit spending, and of higher taxes. A program must be developed through which business and its employees can take a vital interest in politics, he said.

INVESTIGATE THESE REASONS FOR USING OIL FILLED LINK BOXES



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Illustrated above: Oil filled box with gas filled cableheads and stud bushings—3 way, 3 pole, 34.5 kv, 500 mcm, LPGF cables. (Available also with hermetically sealed potheads—either may be filled with compound, oil or gas.)

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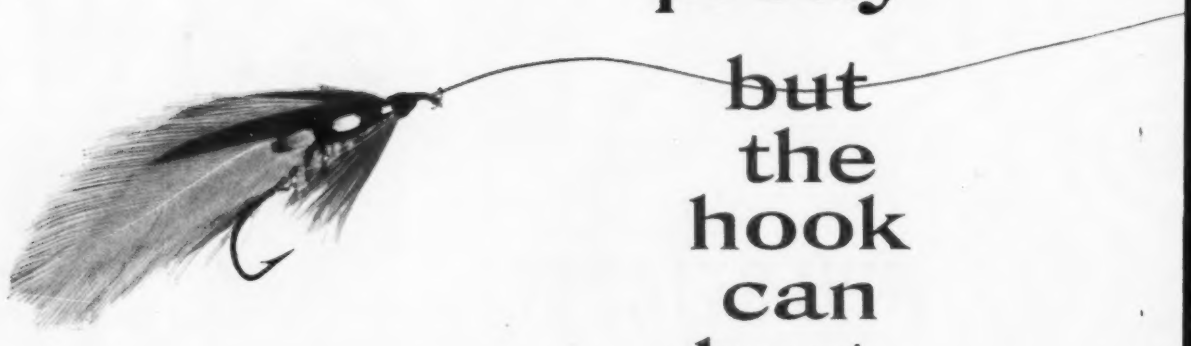
the feathers are mighty pretty



but the hook can hurt

The defenders of public power have done a first-rate job of making their lure enticing—but it's still a trap.

They began by giving their scheme an attractive name, suggesting a project owned by all the people and operated for the common good. "Private" power, conversely, seems to connote an enterprise conducted for private profit, and depriving the people of part of the benefit that should accrue to them.

From there on the public power advocates reason thus: The sources of power (such as fast-moving water) are natural resources belonging to everyone, and should not be allowed to fall into private hands.

There's the delusion. All industries use natural resources of one kind or another. But no resource has much value until it is extracted, cultivated, or otherwise made useful by human effort. This effort, which is "privately" exerted by individuals, is the real cost of the final product, and accounts for most of its price.

No matter who does the job of converting a raw resource to a useful commodity—government or private enterprise—the same essential costs must still be paid. The question therefore boils down to this: Under what type of organization—public ownership or private ownership—is power likely to be generated most economically, and paid for by those who should logically pay for it, the *users*?

Right there's the hook. Because under public ownership, some people get electricity at tax-free rates, while others pay taxes not only on the "private" power they use themselves but must ante up still *more* taxes to pay for the publicly owned power projects too.

Because America long ago chose private enterprise against "public" control of economic activity, its people today are rich and strong and free. If they mean to stay that way, they had better stop nibbling around the bright but deadly "public power" bait.*

* Based on material from The Guaranty Survey, published by Guaranty Trust Company of New York.

Reprints and newspaper mats available at cost for publication of this message locally over the signature of your company. Address Dept. EW-1, Guaranty Trust Company of New York, 140 Broadway, New York 15, for further information.

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The Management Newsletter

Report on
Electrical Business Outlook

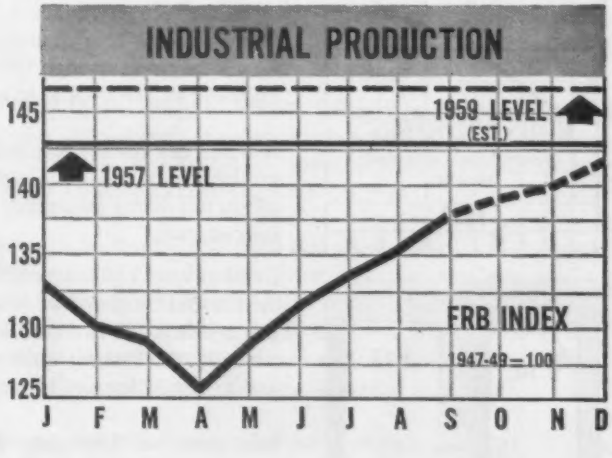
I. How's General Business?

It's still too early to call all the shots for '59, but a few things are clear. (1) The recovery has already made up much of the ground lost in the recession; (2) This year will end with a profitable bang, not a whimper, as in '57; and (3) 1959 is going to be a good year for business—particularly for power and appliance sales. Actually, it's pretty hard to name any industry which isn't looking up or already moving ahead strongly.

For example, take a look at the latest batch of economic indicators released within the past week or so. They show this encouraging picture:

- **Gross national product up $11 billion** in the third quarter and now moving towards a record $450 billion rate.
- **Industrial production up another point** last month despite a big drag in auto output—and moving ahead more strongly this month.
- **Steel pushing consistently past the 70% of capacity mark,** thanks to strength in construction, farm equipment, appliance output and machinery.
- **Personal income at a record $356.1 billion rate** in September—up some $10 billion from the recession low-point.
- **Unemployment down to 4.1 million** in September, even better this month, and factory jobs some 650,000 higher than four months ago.
- **Housing starts at a remarkable 1.22 million rate**—highest in three years.

Recent estimates for third quarter GNP put the total of goods and services at a $440 billion rate. This just matches the 1957 average and means that the economy has made up about two-thirds of the loss in GNP in dollar terms. (In real terms, we should hit a new peak in the next few months). Prime movers in the recovery have been government spending, sustained consumer buying, the surge in housing



Source: McGraw Hill Dept of Economics

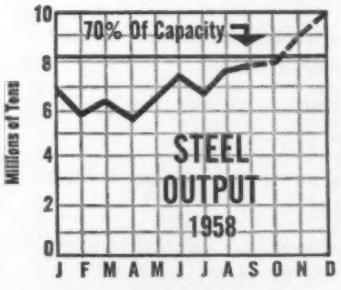
and the turn in inventories. These will push GNP up another $10 billion in the fourth quarter, according to the latest government estimates.

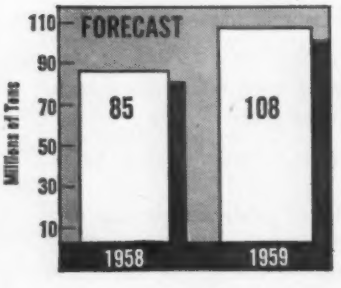
Industrial production has also snapped back substantially—and a good deal faster than seemed likely at mid-year. September's FRB index was 137 (seasonally adjusted), some 11 points above April's low point. Last month's gain was only a single point because strikes and model change-over knocked auto production down to the lowest level for September in 20 years. With some help from Detroit, the index should be well into the 140's by the first of the year.

Output in the heavy power users has rebounded well. For example, take a look at the pattern of production in primary metals, chemicals, paper, food and textiles which together use over 60% of all manufacturing kwhr's.

	1957 avg.	1958 low point	Current Rate
Primary Metals	131	86	112 Est.
Chemicals	184	176	191 "
Paper	158	149	166 "
Food	112	113	116 "
Textiles	99	91	105 "
All Industry	143	126	139 "

The relative strength of these industries helps explain the robust note in industrial kwhr sales in recent months.



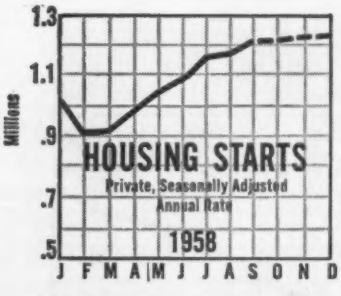


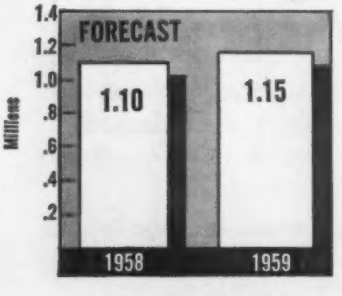
II. The Rebound in Steel and Housing

Steel and housing give two good benchmarks for measuring '59 prospects. Steel is important—not just because it sets the industrial power load in a few key areas—but also because it gives a broad measure of industrial activity, ranging from capital goods to appliances. New housing starts are a key to appliance sales and tell to what degree higher disposable income gets translated into higher residential loads.

In steel, nobody expects 1958's record to be very impressive. Total output will probably not reach much more than 85 million ingot tons—off 25% from '57. But there has been a substantial pick-up in recent weeks. Fourth-quarter rates should run well over 75% of capacity, compared to 48% in April.

Forecasts for '59 run in the neighborhood of 108 tons of steel. This is based on a moderate recovery in autos, machinery and some rebuilding of steel inventories. If capital goods firm up more—and consumer durables start to move—steel activity will be rising strongly throughout 1959. There will be some inventory build-up in the second quarter to anticipate a possible strike.





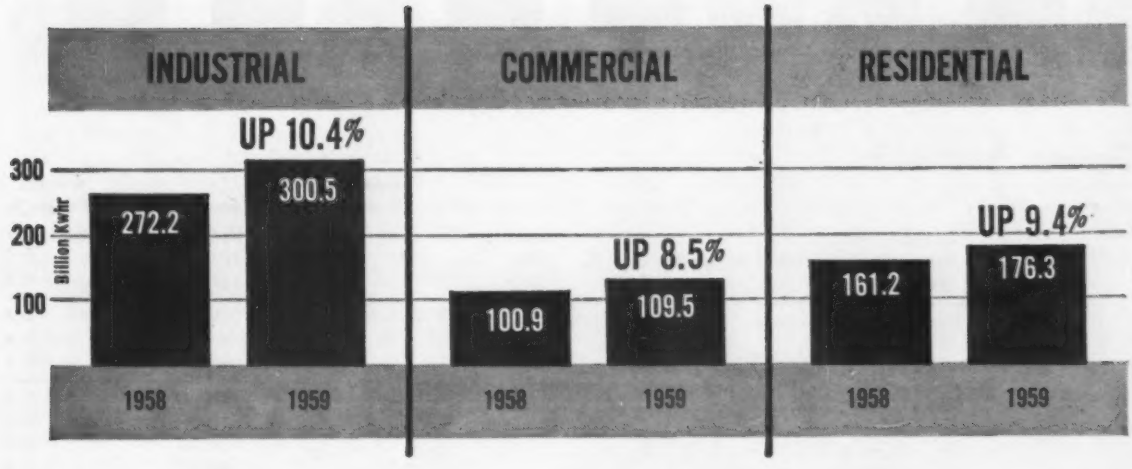
Housing has already reached its peak rate. Starts in September were at a 1.22-million annual rate—the highest since October 1955. This represents a big pay-off on this year's emergency housing legislation, plus the easing in conventional interest rates.

Builders would be happy if this rate could be maintained throughout 1959. On the plus side is consumer income which will be rising steadily next year. On the minus side is tighter credit, which can pull out the props from any housing market. Actually, the interest rates on Veterans' Administration loans are already too low to attract lenders in many areas.

Best guess for '59—about 1,150,000 private housing starts, slightly under the current high rate, but higher than the 1957 level. Starts will be well over 1.2 million, if Congress re-enacts the federal aids to home financing. And this would be a possibility with a Democratic landslide in the fall elections.

III. 1959 . . . Another Growth Year?

How is 1959 shaping up in overall economic terms? Total output of goods and services should reach $465 billion, according to preliminary estimates by the McGraw-Hill Department of Economics. This would be about $29 billion higher than this year—or a substantial gain of 6.6%. Consumer spending will be strong and rising throughout the year—giving more of a push than either government or business outlays. Industrial production will average at least 145, probably higher.



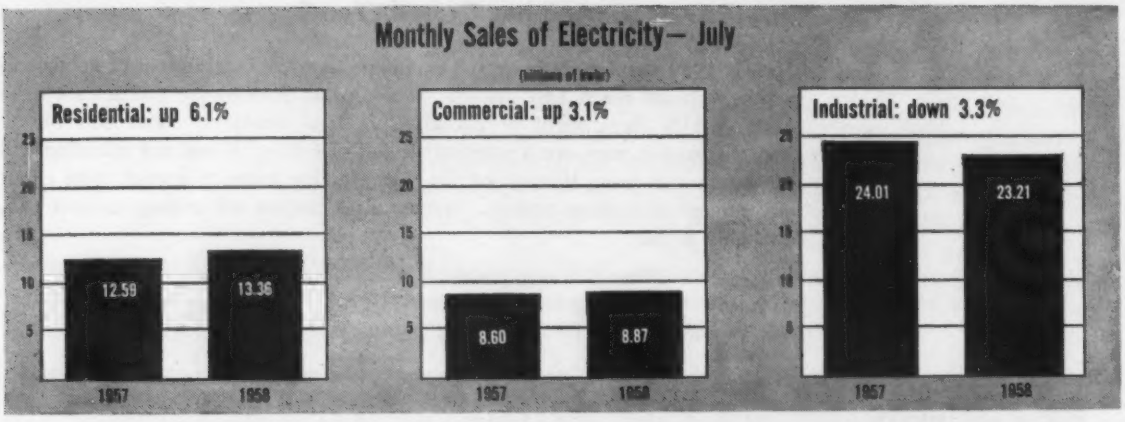
This ties in with the solid growth year for utilities, as forecast by *Electrical World* (September 22, 1958). Total energy sales will be 622 billion kwhr—up 9.5%, as compared to this year's estimated gain of only 1.8%.

The biggest contrast with '58 will come in industrial sales—up 10.4%, compared to a dip of 3.7% this year. The boost will come automatically with higher production rates throughout manufacturing—but also because of the shift to heavy modernization outlays in business capital spending. This trend will also help commercial kwhr's next year—up an estimated 8.5% over 1958.

Residential sales will jump by 15.1 billion kwhrs or 9.4%—thanks to the rise in disposable income, higher employment, a sustained recovery in housing and an improving appliance market. New customer additions should hit 1.1 million in 1959, back up from under a million (a post-war low) this year.

Utility capital spending will be down 8.6% from this year's record $5.1 billion, according to EW's forecast. Outlays for new generating plants will be down 17%, transmission plant expenditures down 9.6%. But spending for new distribution facilities will hit $1.6 billion—up 6.8% over the 1958 level. This parallels the recent growth in commercial and residential sales, which—unlike industrial loads—weren't much affected by the '58 recession.

How do utility budgets compare with the overall trend in capital spending? We'll know next month—with the results of the McGraw-Hill fall survey. And we'll have a clearer idea of how much lift the economy can expect to get in '59 from business investment.



Power Statistics . . .

		Latest Month	Year Ago	Annual Change %
Capacity	July	135.06	124.99	8.1
Peak—Class I Systems (millions kw)	Dec.	107.1	102.4	4.6
Estimated Dec. '58 Peak (millions kw)	July	117.8	122.9	−4.1
Production—billion kwhr	July	54.99	54.35	1.2
Hydro		11.61	10.81	7.4
Fuel		43.38	43.54	−0.4
Sales—billion kwhr	July	48.36	48.09	0.6
Residential		13.36	12.59	6.1
Commercial		8.87	8.60	3.1
Industrial		23.21	24.01	−3.3
Other		2.92	2.88	1.4
Fuel Consumption	July			
Coal—million tons		12.04	12.72	−5.3
Oil—million barrels		6.10	5.51	10.7
Gas—billion cu ft		153.78	158.91	−3.2
Net Income Class A & B Co's—$ million	July	109.02	101.96	6.9
Residential Customers—millions	12 mos.	47.23	46.35	1.9
Revenue per kwhr	ended	2.53¢	2.58¢	−1.9
Avg kwhr per customer	July 31	3,300	3,082	7.1
Avg annual bill		$83.49	$79.52	5.0

Business Statistics . . .

Indexes: 1947–49 = 100				
FRB Industrial Production	Aug.	136	145	−6.2
ENR Construction Cost	Oct.	162.5	154.5	5.2
BLS Cost-of-living	Aug.	123.7	121.0	2.2
New Orders for Machinery (1950 = 100)	Aug.	146	136	7.4
NEMA Sales				
Insulation materials	Aug.	106	134	−20.9
Electric appliances		92	86	7.0
Wholesale prices				
Motors and generators	July	146.5	142.5	2.8
Transformers and regulators		147.6	150.6	−2.0
Switchgear and fuses		173.8	166.9	4.1
GNP—annual rate—$ billion	3rd Qtr	440.0	445.6	−1.3

Significant changes: Slower liquidation of inventories helped gross national product jump to an annual rate of $440 billion in the third quarter, thus regaining ⅔ of its recession losses.

Detroit Edison Figures Electric Heating Costs

S. S. SANFORD, formerly Supervisor of Steam Sales, The Detroit Edison Co, Detroit, Mich.

There are 450 electrically heated homes and 444 units in 50 apartment buildings with electric heat in Detroit Edison Co's service area.

The apartment units are individually metered. Twenty of the 450 residences have heat pumps; the others have resistance heating of various types—glass panels, fan-type wall heaters, ceiling cable, and baseboard heaters.

Commercial and industrial customers using electric heating include motels, offices, two drive-in theaters, a factory, and a cricket hatchery. Detroit Edison has over 10,000 kw of resistance heating in electrically heated buildings, not counting auxiliary heating.

Eighty heat pumps have been sold or installed. There are 20 residences, five with two heat pumps each, offices, restaurants, and industrial buildings.

The use of electricity for space heating has been studied for nine seasons by installing recording meters on heating loads. The most complete records are for a year when data was collected from 35 residences.

Averages were:

Number of Rooms	5.2
Floor area	965 sq ft
Calculated heat loss (0 to 70F)	32,925 Btu/hr
Normal heating season	6,396 degree-days
Electricity for space heating corrected to normal heating season	12,470 kwhr
Cost at 2.18¢ per kwhr	$272
Kwhr per yr per 1,000 Btu/hr of heat loss	378
Kwhr per degree-day per 1,000 Btu/hr of heat loss	0.06

While the average use was 378 kwhr per year per 1,000 Btu/hr of heat loss, it ranged in individual cases from about one-half of this to over twice the average.

The annual load factor based on coincident maximum demand was 22.8%.

Two formulas for estimating the annual kwhr use for space heating in residences have been published. One by The Federal Housing Administration; the other by the National Electrical Manufacturers Assn.

The first one is:

$$F = \frac{H \times D}{Td \times K}$$

where F=estimated kwhr per yr
H=heat loss, Btu/hr
D=degree-days in heating season
Td=temperature difference between inside and outside design temperatures used in heat loss calculation
K=constant

The Federal Housing Administration has estimated the value of K to be from 170 to 200.

If the averages from the Detroit study of 35 homes are substituted in the formula, the value of K is 241.

The second formula, found in NEMA's *Manual for Electric House Heating* is:

$$\text{Annual kwhr consumption} = \frac{HL \times DD \times C}{TD}$$

where HL=heat loss of building in kw
DD=annual degree-days for area
C=constant
TD=temperature difference between inside and outside design temperatures in degrees F.

A conservative value of C is given as 18.5 with a statement that it may be as low as 12. Using the averages from the 35 residences in the Detroit study, the value of C was 14.1. A constant of 18.5 in the NEMA formula is equivalent to 184 in the FHA formula.

RESTAURANT HAS five 7½-hp heat pumps. Electricity used for all purposes totaled 14,000 kwhr for December, 1957

OFFICE HAS 5-hp heat pump. Electricity for heating is 10,000 kwhr at $250 per year, and 2,900 kwhr for AC

CVNPA Elects Will President

E. H. Will, vice chairman of the board and chairman of the executive committee of the Virginia Electric & Power Co, has been elected president of the Carolinas Virginia Nuclear Power Associates, Inc.

O. J. Miller, executive vice president of Duke Power Co, was reelected executive vice president.

Following were made vice presidents: N. A. Cocke, president, Duke Power; A. H. McDowell, president, Virginia E&P; S. C. McMeekin, president, South Carolina Electric & Gas Co, and L. V. Sutton, president, Carolina Power & Light Co.

J. M. Costello was named secretary-treasurer, Eugene Simpson, assistant secretary, and Nell C. Pogue, assistant treasurer.

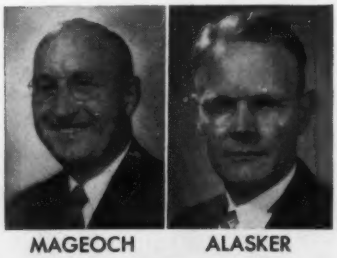
Reelected as general manager was Harry Ferguson who has just arrived to head CVNPA office operations at Charlotte and field operations at Parr Shoals, S. C.

Louisville G&E Makes Top Management Changes

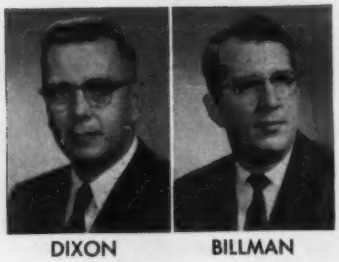
Louisville Gas & Electric Co has promoted B. Hudson Milner to executive vice president (left) and Fred B. Tetzel to vice president in charge of sales, public relations and advertising. Otto C. Krause has been named superintendent of the steam-production department, succeeding Tetzel.

Milner, who will remain treasurer of the company, resigned from the law firm of Middleton, Seelbach, Wolford, Willis & Cochran, counsel to LG&E, to become vice president and treasurer on April 22, 1957.

Tetzel has been with the company since 1926. Since then he has been a construction engineer, plant engineer at Paddy's Run power plant and assistant superintendent of steam production.



MAGEOCH ALASKER



DIXON BILLMAN

Four Personnel Changes at Delta-Star

The Delta-Star Electric Div of H. K. Porter Co, Inc, has made these promotions: H. Yale Mageoch, formerly manager of the Electric Service Works, to director of engineering and research; Allan K. Alasker, formerly assistant chief engineer, to chief engineer and will be in charge of all engineering at the Chicago Works; R. W. Dixon, formerly assistant manager of the Electric Service Works, to manager of the Works; and C. R. Billman, formerly a staff assistant, to assistant manager of the Works in Philadelphia.

Mageoch had also previously served as chief engineer of the Electric Service Works.

Alasker holds an Electrical Engineering degree from Northwestern U, and an MS in EE from California Institute of Technology.

Dixon was chief engineer, vice president, and was active in other management positions with Electric Service Engineering Co before its purchase by the Porter organization in 1955.

Billman studied electrical engineering and is a graduate of Penn State and Harvard Business School. He was general manager of Electric Service Engineering Co when it was bought out by Porter.

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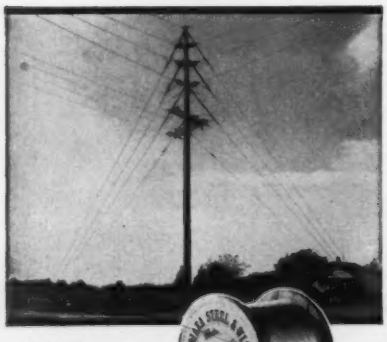


Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

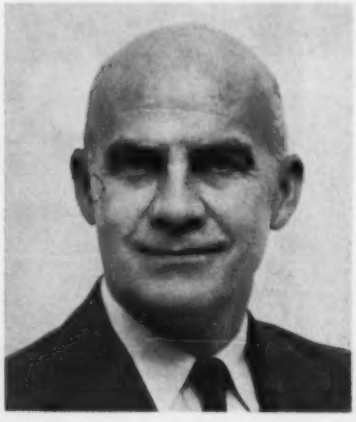
STEEL & WIRE CO., INC., Muncie, Indiana

Ulrich Gets New Post

Max M. Ulrich, formerly of Edison Electric Institute, has been named general manager of advertising and industry research for the Consolidated Edison Co of New York. At EEI, among other staff assignments, he was secretary to the Atomic Power Committee and to the Technical Appraisal Task Force on Nuclear Power.

Hinckley New IES Director

A. Dexter Hinckley, executive secretary of the Illuminating Engineering Society, has been named to a newly-created position of managing director. This new post was created by the society's governing body to relieve its president of many detailed operating duties that developed as the 52-year-old society grew to include some 9,000 members in 83 sections and chapters in the U. S. and Canada.



PERSONAL BRIEFS

Harold H. Henninger has been appointed assistant to the president of Pacific Power & Light Co.

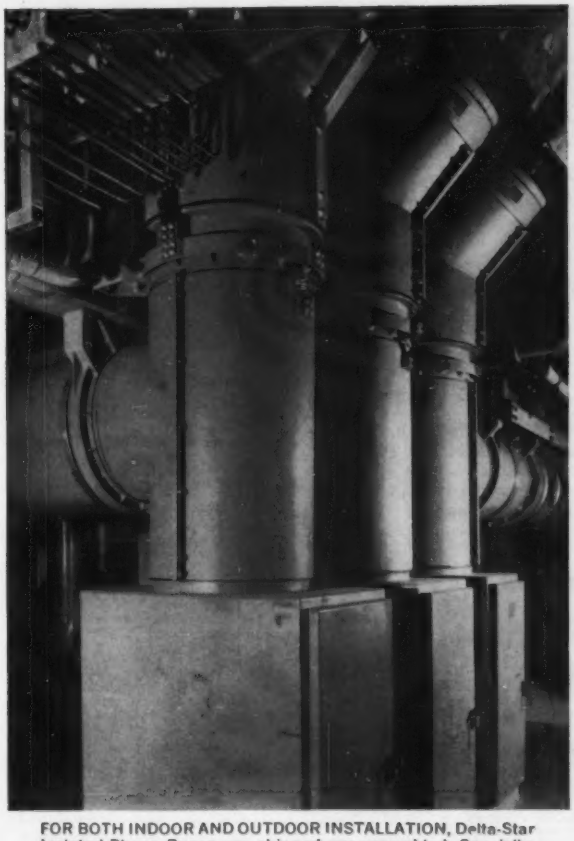
Detroit Edison Co has named **Kenneth P. Locke** director of the budget division of the control department.

New England Electric System has made these promotions recently: **Ogden E. Sawyer** has become assistant chief engineer of the New England Power Service Co. **Frank R. Goodwin** is now district engineer of the Worcester County Electric Co, succeeding **Kenneth W. Landry,** retired. **Clifford Hartley,** superintendent of electrical construction for New England Power Service, will serve temporarily as acting construction manager for NEES, during temporary assignment of **Frank R. Joslin** to the post of assistant to Executive Vice President **William Webster** of NEES. **Donald Reed** has been appointed chief load dispatcher of the NEES, succeeding **Clement P. Cory** who has been transferred to Boston headquarters.

Memphis, Tenn., Light, Gas & Water has named **Carl L. Bledsoe** as superintendent of the Thomas H. Allen electric generating station. Bledsoe was plant superintendent for the Illinois Power Co.

Michigan Public Service Commission has appointed **Norman Berkowitz** secretary . . . Wisconsin PSC has named **Edmund J. Krawczyk** a commissioner, succeeding **Nicholas J. Lesselyoung,** resigned.

Hotpoint Co has appointed **George R. Cero** supervisor of advertising and sales promotion.



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3	300	West.	69,000–6900
3	200	West.	44,000–480
1	5000	West.	34,500–13750/6875, 3 Ph.
1	3750	G.E.	34,400–13800/7960, 3 Ph.
2	3000	Uptegraff	34,750–4160, 3 Ph.
2	3000	Stand.	33,000–4160, 3 Ph.
2	1500	G.E.	34,400–2520, 3 Ph.
3	1000	A.C.	34,650/11,500–2300
3	200	A.C.	34,500–2400/7200/12470Y
1	3000	A.C.	23,380–2500/4300Y, 3 Ph.
2	1500	G.E.	23,000–2400/4800, 3 Ph.
3	100	G.E.	22,000–7200/12470Y
1	7500	A.C.	13,800–2400, 3 Ph.
3	2500	G.E.	13,800–2300, 3 Ph.
3	1667	G.E.	13,800–600
3	667	Kuhl.	13,800–480
1	600	Stand.	13,200–2300, 3 Ph.
1	450	Penna.	13,200–2400, 3 Ph. Askarel
3	333	Uptegraff	13,800–480
1	4500	West.	7200–2400, 3 Ph.
3	333	Penn.	7200/12470–480
3	333	Mol.	7200/12470–2400/4160
3	125	A.C.	6900–2300
3	100	G.E.	4800–120/240
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200	G.E.	2300	250/275
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150	G.E.	440	250/275
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125	G.E.	2300	250
125	WEST	2300	250
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The Meetings Calendar

NOVEMBER

• **Institute of Radio Engineers**—National Automatic Control Conference, Sheraton-Dallas Hotel, Dallas, Texas, Nov. 4-6.

New Jersey Utilities Association—Annual Meeting, Seaview Country Club, Absecon, N. J., Nov. 5-7.

Pennsylvania Electric Association—Fall Relay Committee, Americus Hotel, Allentown, Pa., Nov. 6-7; Transmission and Distribution Committee, Mountain View Hotel, Greensburg, Pa., Nov. 13-14.

The Institute of Radio Engineers—Fifth Annual National Meeting of the Professional Group on Nuclear Science, San Mateo, Calif., Nov. 6-7.

• **Louisiana Polytechnic Institute**—School of Engineering, Seventh Annual Instrumentation Conference, Ruston, La., Nov.. 6-7.

Atomic Industrial Forum—Annual Conference,, Shoreham Hotel, Washington, D. C., Nov. 10-12.

Edison Electric Institute—Accident Prevention Committee, Hotel McAlpin, New York City, Nov. 10-12; Industrial Power & Heating Group, Pittsburgh, Pa., Nov. 19-21; Commercial Lighting Committee, Philadelphia, Pa., Nov. 20-21.

National Electrical Manufacturers Association—Annual Meeting, Traymore Hotel, Atlantic City, Nov. 10-14.

Southeastern Electric Exchange—Sales Committee, Atlanta Biltmore Hotel, Atlanta, Ga., Nov. 11-13.

Electric Council of New England—Annual Conference, Hotel Somerset, Boston, Mass., Nov. 13-14.

National Association of Railroad and Utilities Commissioners—Annual Convention, Westward Ho Hotel, Phoenix, Ariz., Nov. 17-20.

American Standards Association — National Conference on Standards, Roosevelt Hotel, New York City, Nov. 18-20.

Pacific Coast Electrical Association—Administrative Services Conference, Hotel Claremont, Berkeley, Calif., Nov. 19-20.

American Society of Mechanical Engineers—Annual Meeting, Statler & Sheraton McAlpin Hotels, New York City, Nov. 30-Dec. 5.

DECEMBER

• **American Mining Congress**—Annual Membership Meeting—Plaza Hotel, New York, N. Y., Dec. 1.

American Society of Refrigerating Engineers—45th Semi-annual Meeting, Roosevelt Hotel, New Orleans, La., Dec. 1-3.

• **National Warm Air Heating and Air Conditioning Association**—Committee Meetings and Annual Convention, Cleveland, Ohio, Dec. 1-4.

• **The American Society of Mechanical Engineers**—23rd National Exposition of Power & Mechanical Engineering, New York Coliseum, NYC., Dec. 1-5.

• **Eastern Joint Computer Conference & Exhibit**—Bellevue-Stratford Hotel, Philadelphia, Pa., Dec. 3-5.

• **Institute of Radio Engineers**—Annual Conference of the Professional Group on Vehicular Communications, Sherman Hotel, Chicago, Ill., Dec. 4-5.

• **Edison Electric Institute**—EEI-AGA Electronics Seminar, Commodore Hotel, New York City, Dec. 1-3, Street Lighting Committee, Hendersonville, N. C., Dec. 3-4; Industrial Relations Committee, EEI Headquarters, New York City, Dec. 4.

• **Electric Companies Public Information Program**—Steering Committee, Palmer House, Chicago, Ill., Dec. 8.

• **American Nuclear Society**—Annual Meeting, Sheraton Cadillac Hotel, Detroit, Mich., Dec. 8-10.

• **Washington Public Utility Districts' Association**—Annual Membership Meeting, New Washington Hotel, Seattle, Wash., Dec. 11-12.

JANUARY - 1959

• **Pennsylvania Electric Association**—Communications Committee, January 21-22; System Operation Committee, Johnstown, Fort Stanwix Hotel, January 29-30.

American Society of Heating & Air-Conditioning Engineers—14th International Heating & Air-Conditioning Exposition, Convention Hall, Philadelphia, Pa., Jan. 26-29.

• **Twenty-Sixth Annual Conference of Doble Clients**—Sheraton Plaza Hotel, Boston, Mass., Jan. 26-30.

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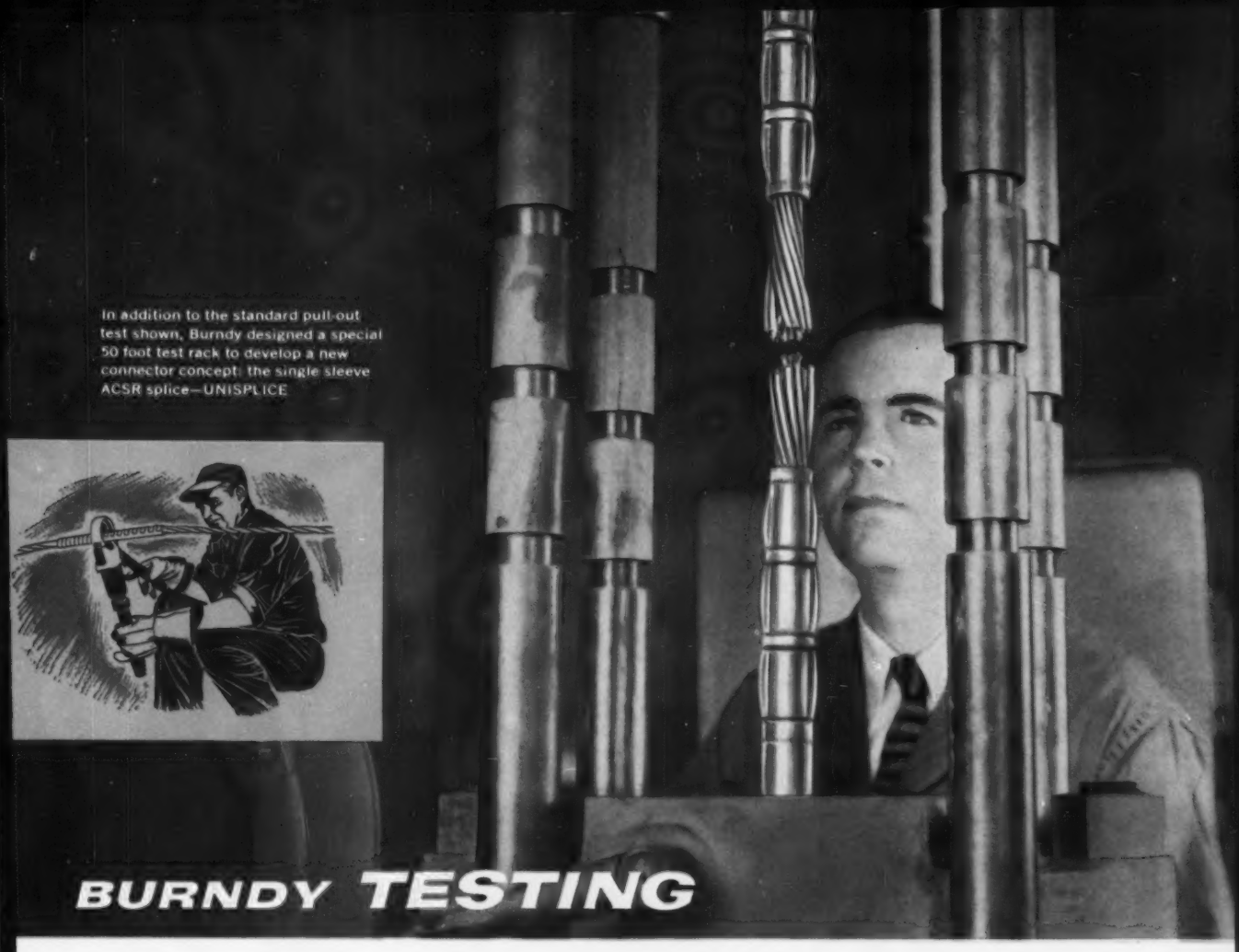

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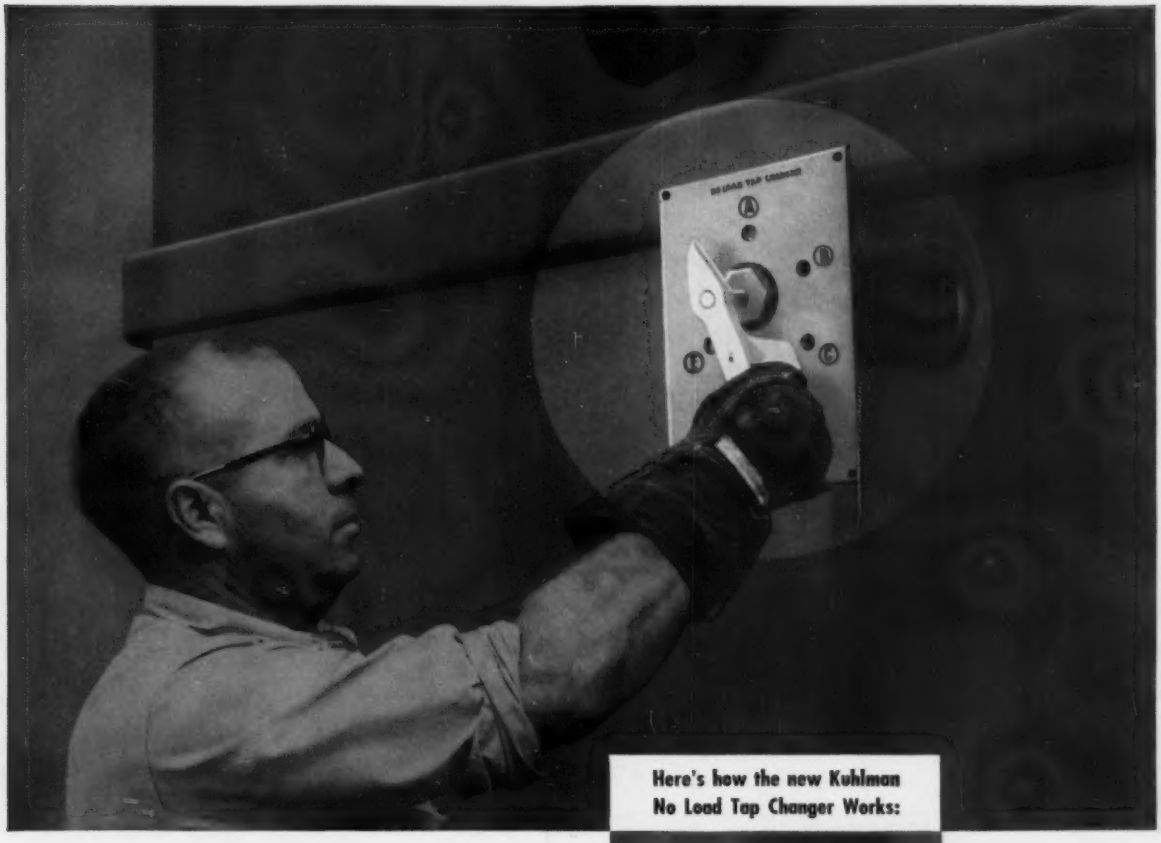

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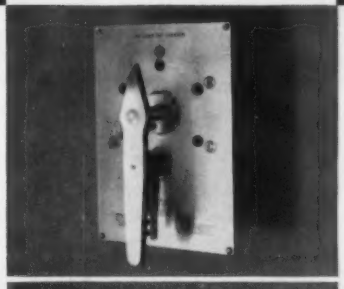
The new "self-aligning" tap changer now standard on all Kuhlman Substation Transformers puts an end to inefficient tap connections caused by misalignment.

The rotor contacts of the new tap changer function as a "free-acting" crosspin universal joint which eliminates the problem of misalignment between the rotor and stationary contacts. This "free-action" assures positive contact, true alignment always, and obsoletes the commonly used "flat surface" contacts which, by their construction, are subject to the faults of misalignment.

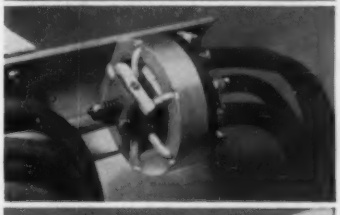
The new tap changer also features a new pistol-grip handle which locks in position and a quick-disconnect mechanism for simple, manual disengagement of the tap changer without the use of tools when untanking the core and coil assembly.

*patent applied for

Here's how the new Kuhlman No Load Tap Changer Works:



The pistol-grip trigger release allows the handle to be moved to the desired tap position. The trigger plunger then snaps solidly into position where it can be padlocked if desired.



The "free-acting" rotor contacts, functioning as a crosspin universal joint, eliminate the problem of misalignment between the rotor and stationary contacts.

Tap changer can be disconnected for removing the core and coil assembly by a tongue and groove mechanism located inside the tank.

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